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*Reports of the Department of
Commerce. Report of the ...*

United States. Dept. of Commerce



Cl. 1.
1914.

REPORTS
OF THE
DEPARTMENT OF COMMERCE

1914

REPORT OF THE SECRETARY OF COMMERCE
AND
REPORTS OF BUREAUS



WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

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CONTENTS.

REPORT OF THE SECRETARY OF COMMERCE.

| | Page. |
|--|-------|
| Introduction..... | 9-21 |
| Appropriations and expenditures..... | 21 |
| Personnel..... | 27 |
| Printing and binding..... | 33 |
| Work of the Solicitor's Office..... | 39 |
| Bureau of Foreign and Domestic Commerce..... | 41 |
| Commercial attachés..... | 41 |
| Commercial agents..... | 42 |
| Branch offices..... | 43 |
| Cost of production..... | 46 |
| Statistics..... | 46 |
| Bureau of Corporations..... | 49 |
| Merger of Bureau in Federal Trade Commission..... | 49 |
| Work of the year..... | 49 |
| Work pending at the beginning of the year..... | 50 |
| New work undertaken..... | 50 |
| Work completed..... | 51 |
| Bureau of Standards..... | 53 |
| Functions..... | 53 |
| Weights and measures of trade..... | 54 |
| Public utilities..... | 55 |
| Manufacturers, etc..... | 57 |
| Educational institutions..... | 60 |
| Work for State governments..... | 60 |
| Precision standards..... | 61 |
| New standards..... | 62 |
| Government testing bureau..... | 64 |
| Information..... | 65 |
| The Bureau's influence in establishing scientific research and methods in the industries..... | 66 |
| Buildings..... | 66 |
| Additional ground..... | 67 |
| Investigation of clay products..... | 67 |
| Transverse testing machine..... | 67 |
| Bureau of the Census..... | 69 |
| Completed work..... | 69 |
| Deferred Thirteenth Census work..... | 69 |
| Forest products..... | 70 |
| Official Register of the United States..... | 71 |
| Current work..... | 72 |
| Wealth, debt, and taxation..... | 72 |
| Electrical industries..... | 73 |
| Dependent, defective, and delinquent classes..... | 74 |
| Statistical Atlas of the United States..... | 74 |
| Special compilations of Thirteenth Census statistics..... | 74 |

Bureau of the Census—Continued.

| | |
|--|--------------|
| Current work—Continued. | Page. |
| Vital statistics..... | 75 |
| Statistics of cities..... | 76 |
| Cotton and cottonseed..... | 77 |
| Tobacco..... | 78 |
| Information furnished by correspondence..... | 79 |
| Plans for future work..... | 79 |
| Census of manufactures..... | 79 |
| Census of agriculture..... | 80 |
| Statistics of Federal employees..... | 80 |
| Office force..... | 81 |
| Appropriations and expenditures..... | 81 |
| Financial statement, fiscal year 1914..... | 81 |
| Appropriations, fiscal year 1915..... | 83 |
| Publications issued..... | 83 |
| Bureau of Fisheries..... | 85 |
| Propagation of food fishes..... | 85 |
| The fishing industry..... | 87 |
| Coastal and high-sea investigations..... | 89 |
| Surveys and investigations of lakes and streams..... | 91 |
| Operations at the fisheries laboratories..... | 93 |
| Protection of Alaska fisheries..... | 95 |
| Fur-Seal Service..... | 97 |
| Minor fur-bearing animals of Alaska..... | 100 |
| Miscellaneous matters..... | 103 |
| The Aleutian Islands reservation..... | 103 |
| Fishery matters in Congress..... | 103 |
| Cooperation with other departments..... | 104 |
| Pacific coast branch..... | 104 |
| Maine lobster conference..... | 105 |
| Pollution of waters..... | 105 |
| Utilization of neglected aquatic products..... | 105 |
| Fish culture on the farm..... | 106 |
| Alaska inspection..... | 106 |
| Urgent need for fish pathologist..... | 107 |
| Bureau of Lighthouses..... | 108 |
| Administrative methods and economies..... | 108 |
| Cooperation..... | 112 |
| Legislation affecting the Lighthouse Service..... | 114 |
| Appropriations..... | 114 |
| Aids to navigation..... | 115 |
| Alaska..... | 118 |
| Engineering and construction..... | 120 |
| Improvement of apparatus and equipment..... | 121 |
| Vessels..... | 123 |
| Saving of life and property..... | 123 |
| Coast and Geodetic Survey..... | 132 |
| Extent and efficiency of service..... | 132 |
| Inadequate housing accommodations..... | 133 |
| Replacing of unseaworthy vessels..... | 134 |
| Extension of wire-drag service..... | 143 |
| Wrecks in Alaskan waters..... | 148 |
| Economical use of inadequate funds..... | 150 |

| | |
|--|--------------|
| Coast and Geodetic Survey—Continued. | Page. |
| Geodetic work | 158 |
| Changes in Washington office..... | 165 |
| Miscellaneous services performed..... | 167 |
| Field work of surveying parties and vessels..... | 170 |
| Steamboat-Inspection Service..... | 174 |
| Summary of work..... | 174 |
| Activities of the Service..... | 175 |
| Hull inspection..... | 175 |
| Boiler inspection..... | 177 |
| Motor vessels..... | 178 |
| Licensing of officers..... | 180 |
| Transportation of persons..... | 180 |
| Transportation of dangerous articles | 181 |
| Extension of the Service..... | 182 |
| Division of districts..... | 183 |
| Summary of proposed legislation affecting the Service..... | 184 |
| Bureau of Navigation..... | 185 |
| Tonnage of the merchant marine..... | 185 |
| Navigation receipts..... | 187 |
| Shipping commissioners..... | 188 |
| Radio communication..... | 188 |
| Enforcement of navigation laws..... | 189 |
| Passenger act of 1882..... | 194 |
| General anchorage law..... | 194 |
| Safety of life at sea..... | 194 |
| International conference..... | 195 |
| Conclusion..... | 196 |

REPORTS OF BUREAUS.

| | |
|--|------------|
| BUREAU OF FOREIGN AND DOMESTIC COMMERCE | 203 |
| BUREAU OF CORPORATIONS | 221 |
| BUREAU OF STANDARDS | 269 |
| BUREAU OF THE CENSUS | 363 |
| BUREAU OF FISHERIES..... | 391 |
| BUREAU OF LIGHTHOUSES | 471 |
| COAST AND GEODETIC SURVEY..... | 569 |
| STEAMBOAT-INSPECTION SERVICE..... | 691 |
| BUREAU OF NAVIGATION | 721 |
| APPOINTMENT DIVISION..... | 753 |
| DIVISION OF PUBLICATIONS..... | 775 |

| | |
|-------------------|------------|
| INDEX..... | 819 |
|-------------------|------------|

REPORT
OF THE
SECRETARY OF COMMERCE

ANNUAL REPORT OF THE SECRETARY OF COMMERCE.

DEPARTMENT OF COMMERCE,
OFFICE OF THE SECRETARY,
Washington, November 10, 1914.

To the PRESIDENT:

I have the honor to submit herewith my second annual report, covering the operations and condition of the Department during the fiscal year ended June 30, 1914, and tracing in a general way its history through the month of October, 1914.

The organization of the Department was not changed during the fiscal year. The nine bureaus composing it during this period were those of Foreign and Domestic Commerce, Corporations, Standards, Census, Fisheries, Lighthouses, Coast and Geodetic Survey, Steamboat-Inspection Service, and Navigation. To these should be added the Office of the Secretary, consisting of five divisions, namely, Office of the Chief Clerk (including the Division of Supplies), Disbursing Office, Appointment Division, Division of Publications, and the Office of the Solicitor. By the act creating the Federal Trade Commission the Bureau of Corporations will be detached from the Department when that commission is organized and will form its administrative nucleus.

The hope expressed in my last report that the Bureau of the Census might be united with the rest of the Department by an addition to the Commerce Building has been carried into effect. Early in 1914 the Department made an informal agreement with the Commerce Building Co. for the construction of an 11-story and basement, steel-frame, fireproof addition to the present Commerce Building, at Nineteenth Street and Pennsylvania Avenue NW., in order to house the Bureau of the Census. The arrangement provided that the Department would, if the matter were approved by Congress, lease the addition at a rental of 40 cents per square foot, and that the building would be ready for occu-

pancy on or before September 1, 1914. Congress in the legislative, executive, and judicial act approved July 16, 1914, appropriated \$17,500 for the rent of the addition, which is at a rate not exceeding 35 cents per square foot, but authorized the leasing of the addition for a period of five years. The regular amount paid during the past nine years for rental for the Bureau of the Census has been \$21,000 per annum.

The construction of the addition began February 27, 1914, and the building was ready for occupancy on July 1, 1914. The Commerce Building Co. advised the Department on May 22 that the building would be ready for use on July 1, and the work of moving the Bureau of the Census began June 1. The large electric truck of the Bureau of Standards and that of the Bureau of the Census, with three wagons owned by the Department, were used to do most of the moving; some of the heavier hauling was performed by two local transfer companies. The appropriation of \$1,500 granted by Congress for moving the Bureau of the Census was not required and will be returned intact to the Treasury at the close of the present fiscal year.

By moving the Bureau of the Census into the enlarged Commerce Building, the Department was enabled to reduce its expenditures for the fiscal year ending June 30, 1915, by \$24,280. The change has also reduced the risk of the destruction by fire of valuable records of the Bureau, as the addition contains a fireproof vault in which these records are kept.

The Bureau of the Census is now housed with most of the other bureaus of the Department, and its officers and employees have expressed satisfaction with the improvement in their working conditions, particularly in the respects of light and ventilation. By the above-described change the Government is paying much less for greatly improved service. As a business proposition the scattering of a department through several buildings located in different parts of the city can never be justified. It is a cause of hourly waste, a producer of delays, and a creator of inefficiency. Only compelling reasons can warrant operating an organization which should be one whole through separate and distantly related parts.

There is a daily loss both of money and of effectiveness in the separation of the Bureau of Fisheries, the Bureau of Standards, and the Coast and Geodetic Survey from the rest of the Department. The work of the Bureau of Standards is such, however, as

to require that it be placed at a distance from the built-up portions of the city. No such condition affects the Coast and Geodetic Survey and the Bureau of Fisheries, one of which is near the Capitol and the other on the Mall, both so placed as to insure the maximum expense in operation and maintenance with the least efficiency in results. Furthermore, the buildings owned by the Government in which the Coast and Geodetic Survey and the Bureau of Fisheries are located are ill-adapted for their purposes. It would be hard to find two buildings worse suited for the uses to which they are put than these. Important work of the Coast and Geodetic Survey is conducted in what was an old stable, and the invaluable plates and records of the Survey are in constant danger from fire. Two small fires have already occurred and would have resulted in the destruction of the building if they had not been early discovered by accident. The building occupied by the Bureau of Fisheries was built as an armory for the militia of the District of Columbia in 1856. In 1878 it was a storehouse. In 1882 it was used for a fish hatchery. It has long been out of date. No private concern with an eye to economical management would permit the use of these buildings for their respective purposes longer than necessary for obtaining the funds to replace them.

I recommend that the proposed new Government building for the Department of Commerce be so planned that it shall contain the Coast and Geodetic Survey and the administrative portion of the Bureau of Fisheries.

The Bureau of Fisheries should be provided with a modern aquarium, suited alike for the education of the public and the carrying on of the scientific work of the Bureau. This should be housed in a separate building, located as near as practicable to the proposed new building for the Department.

Land has already been purchased by the Government for a building for the Department of Commerce and it would, in my judgment, be easy to revise the plans for the space intended at the time the plans were made for the bureaus since diverted into the Department of Labor, so that the building may receive, as above stated, the Fisheries and the Coast and Geodetic Survey, allowance at the same time being made for the removal of the Bureau of Corporations, which has been merged into the Federal Trade Commission. In this connection I renew my protest against the policy of paying rent to private parties for

buildings for the public service, especially when this requires the work of a great department to be split into separate parts at a greatly enhanced cost for operation. It is not good business sense to pay through rentals to private parties twice as high a rate of return on their investments as that which the Government would pay for money invested in buildings of its own.

The Department of Commerce occupies the Commerce Building under a lease with nearly four years to run. It would take substantially that time to complete the new structure and it would, in my judgment, be wise policy to proceed promptly with the latter. The site now occupied by the Coast and Geodetic Survey, of which a portion is occupied by the United States Public Health Service, is a valuable corner adjoining the Capitol, admirably suited for a building to be used in connection with the legislative branch but unfit for part of an executive department most of which is at the far end of the city. The union of all the bureaus of the Department into one efficient working whole is an end of primary importance to be sought so far as it is practicable to bring it about. It should be remembered that the Department has had experience in operating in separate scattered units and again in operating with six of its nine units gathered into one building. The knowledge thus gained points to the wisdom of grouping the whole Department together as nearly as possible under one roof at the earliest practicable time.

The act approved October 22, 1913, authorized the Secretary of Commerce to enter into a contract for the rental of a water-cooling plant in the Commerce Building, and such an apparatus has been installed. It consists of a refrigerating plant and pump located in the basement, with 51 fountains located throughout the building. This system gives general satisfaction and has enabled the Department to dispense with 75 water coolers.

In March, 1914, the Department purchased a light gasoline truck to carry mail between the post office, the Commerce Building, the Bureau of Fisheries, the Coast and Geodetic Survey, and the Bureau of the Census as then located, and to make miscellaneous trips to various departments, bureaus, and places of business. This work had till then required three horses and wagons and an electric truck, each with at least one employee and in some cases with two. Since the Bureau of the Census came to the Commerce Building the use of the electric truck of that Bureau has enabled the Department to dispense in all with four horses and wagons.

The gasoline truck has now been in operation six months. Its use has resulted in a direct saving in money and in quicker and better service.

This Department has turned over to the Department of Labor the following articles since November 5, 1913:

| Article. | Number. | Value. | Article. | Number. | Value. |
|---|---------|---------|--|---------|----------|
| Key case..... | 1 | \$10.00 | Halter and chain..... | 1 | \$1.90 |
| Cuspidors..... | 6 | 2.88 | Scale, Buffalo drop-lever platform..... | 1 | 37.75 |
| Doors, swinging..... | 30 | 272.80 | Ladders, trolley, suspension, complete with track..... | 2 | 32.00 |
| Racks, towel..... | 2 | 1.25 | Ladders, trolley side, complete with track..... | 2 | 43.00 |
| Skid, truck..... | 1 | 2.98 | Brackets, fan..... | 36 | 72.00 |
| Horse cover, storm..... | 1 | 4.25 | Shades, holophane, assorted, 25 to 100 watts..... | 247 | 186.26 |
| Horse blanket, night..... | 1 | 5.00 | Fixtures, ceiling..... | 30 | 382.08 |
| Surcingle..... | 1 | 1.50 | Hoe, fire..... | 1 | 1.60 |
| Storm apron for wagon..... | 1 | 3.50 | Shovel, scoop..... | 1 | 1.10 |
| Nose bag..... | 1 | 1.00 | Extinguishers, fire..... | 4 | 46.40 |
| Horse, bay..... | 1 | 235.00 | Carpet..... | b 88½ | 147.96 |
| Wagons, mail..... | 2 | 375.00 | Linoleum..... | b 860 | 1,087.90 |
| Harness, single wagon, brass mounted..... | a 1 | 47.00 | | | |
| Blanket, street..... | 1 | 4.00 | | | |
| Blanket, stable..... | 1 | 6.40 | | | |
| Weight, hitching..... | 1 | .50 | | | |
| | | | Total..... | | 3,012.93 |

a Set.

b Yards.

As furniture, equipment, etc., valued at \$9,489.84, were similarly transferred to the Office of the Secretary of Labor during the preceding fiscal year, the value of all such equipment transferred amounts to \$12,502.77.

The sundry civil act approved June 23, 1913, contained an appropriation of \$500,000 for the participation of the Government of the United States in the Panama-Pacific International Exposition at San Francisco, Cal., February 20 to December 4, 1915. The Government exhibit board, which is in charge of the Government exhibits, allotted \$54,625 for those of this Department. This sum was suballotted by the Department as follows:

| | |
|--|---------|
| Bureau of the Census..... | \$5,700 |
| Bureau of Foreign and Domestic Commerce..... | 950 |
| Bureau of Standards..... | 11,400 |
| Bureau of Fisheries..... | 25,650 |
| Bureau of Lighthouses..... | 4,750 |
| Coast and Geodetic Survey..... | 3,800 |
| Bureau of Navigation..... | 950 |
| In reserve..... | 1,425 |

The exhibits of the various bureaus are in preparation, and moving pictures have been taken of several features of the Department's work. This Department will make an attractive showing.

The cost of maintaining the Department of Commerce for the fiscal year ending June 30, 1914, including \$410,700.77 for printing and binding, was \$11,424,335.84. On June 30, 1914, there were turned into the surplus fund in the Treasury unused balances of appropriations amounting to \$347,162.48.

The force employed by the Department fluctuates greatly. At the close of the fiscal year there were employed, including all temporary and per diem services, 9,936 persons. This does not, however, represent the total number of persons who at one or another time were employed during the year. The total number of such employments throughout the fiscal year was 18,687.

The Department used the following vessels:

| | |
|--------------------------------|-----|
| Coast and Geodetic Survey..... | 12 |
| Bureau of Navigation..... | 1 |
| Bureau of Lighthouses: | |
| Tenders..... | 45 |
| Light vessels..... | 66 |
| Bureau of Fisheries..... | 9 |
| Total..... | 133 |

This is exclusive of 4 vessels loaned to the Coast and Geodetic Survey by the Philippine government and of 2 steam launches and 30 motor boats operated by the Bureau of Fisheries.

The services of the Department include surveying, charting, and lighting the Atlantic, Pacific, and Gulf coasts of the continental United States, the shores of Alaska, and the Aleutian Islands, Hawaii, and Porto Rico, lighting of the Great Lakes with their connecting rivers and other navigable streams, and surveying of the coasts of the Philippine Islands, their adjacent waters, and the shores of Guam and of Samoa.

The Bureau of Fisheries maintains 36 main and 94 auxiliary fish hatcheries and cultural stations and exercises supposed supervision over the salmon fisheries of Alaska and over the native community and the seal and fox herds on the Pribilof Islands, in the Bering Sea. As explained in my last report, the supervision exercised by the Bureau of Fisheries over the numerous salmon canneries and the fisheries along the Alaskan coast has been more alleged than real. The condition has been one admirably suited to a comic opera. Four salmon agents have been supposed, with-

out boats or other means of transit, to cover many thousand miles of coast, much of it without regular passenger lines. They have been forced, therefore, into the absurd position of calling upon the canneries which they were to inspect to lend them boats in order that they might reach the cannery to inspect it. This admirable example of "how not to do it" has been going on for years. On learning the facts Congress provided a fund of \$50,000 from which to secure vessels to provide proper means of transit for doing this work. When it shall furnish the men necessary, the ridiculous position that the Government has in this respect long occupied will cease to exist.

The Bureau of Standards has laboratories in Washington and Pittsburgh and has conducted cement testing through a special plant for that purpose located at Northampton, Pa. This great and fruitful service maintains close and increasing touch with State and municipal authorities and with industries all over the land. Its aid to other Government departments is invaluable.

The Coast and Geodetic Survey maintains, in addition to its extensive surveying and charting operations, magnetic observatories at Cheltenham Md.; Tucson, Ariz.; Vieques, P. R.; Sitka, Alaska; and Honolulu, Hawaii, and takes tidal observations at regular stations in Maine, New York, New Jersey, Pennsylvania, Maryland, Florida, Texas, California, Washington, and Alaska.

This Survey is the oldest scientific service of the Government. It is also the greatest of its kind in the world, and the efficiency of its work is as marked as its extent; it is so recognized by other nations. Its methods and standards are approved by all who have accurate knowledge of the subject. There are single features of its work which are greater than the combined services of a similar nature of like departments in other great nations. Comparison, for example, of the tremendous task of surveying and charting the coasts of Alaska and the Aleutian Islands with that involved in the coast surveys of France or Great Britain will show to anyone the burden which this service so ably bears. Its duties in the Philippine Islands are of greater extent and importance, alike locally, nationally, and internationally, than are those of the entire like service of many another great nation.

The duty of the Coast Survey deals first with humanity and second with commerce. Its work comes foremost in the protection of life and property along our shores and in opening the way for trade; yet after an experience of 20 months I affirm, without

fear of successful contradiction, that the past attitude of the Government toward the Coast and Geodetic Survey, if the magnitude of its task be considered and the quality of its work be weighed, has been both with respect to its housing, its vessels, and to the necessary apparatus for its serious tasks, and particularly as regards the Pacific coast and Alaska, like that of a wealthy and prosperous man refusing to give to his loyal children the necessities of life.

I speak of this in detail later. It is thus placed in the forefront of my report and with intended emphasis that this Department may not have upon its conscience and its record the responsibility for the loss of human life and property that has ensued from penuriousness respecting this service in the past and will ensue unless this policy is changed.

These are strong words. They are amply justified. Their truth can not be successfully challenged. Our citizens have been drowned (31 in one case) and both private and public property repeatedly lost because the United States Government has not more rapidly provided the force and apparatus with which to survey and chart the dangerous waters of our Pacific and particularly of our Alaskan coast.

The Bureau of Foreign and Domestic Commerce has in operation offices in New York, Chicago, San Francisco, New Orleans, Boston, Atlanta, Seattle, and St. Louis. None of these was in existence when the present administration took charge. They have been established to bring the services of this great Bureau closer to the business public. They have met with a welcome that has been embarrassing in its extent. Other cities, among them Pittsburgh, Detroit, and Baltimore, have applied to have similar offices established in them. The Department earnestly desires to extend this service and will do so as fast as funds are provided.

The Bureau of Navigation enforces the navigation laws of the United States along the Atlantic coast and in the rivers and harbors connected therewith. It acknowledges with thanks the efficient aid of the Steamboat-Inspection Service, of the Revenue-Cutter Service, and of the customs collectors in this important work, the details of which are given later.

The Steamboat-Inspection Service was never more effective than now, and steadily gains in efficiency. It is manned with an admirable staff, showing a fine professional spirit, keenly conscious of the importance of its duty in safeguarding life and property, doing its work with firmness and with tact.

The Bureau of the Census is for the first time properly housed. Its invaluable records are for the first time safeguarded against fire. It has completed the inherited work of the Thirteenth Census and is taking up the census of manufactures, soon to be taken as of December 31, 1914, in an enthusiastic spirit, with effective methods. It looks forward to the agricultural census to be taken under the act of July 2, 1909, as a further opportunity for improved service.

The Bureau of Lighthouses is the greatest organization of its kind and is maintained at a high standard. Through the liberality of Congress and by careful economy of funds it has been found possible for the first time to equip a number of its seagoing tenders with wireless apparatus and to bring the wages paid to its seamen upon the Atlantic coast a little more in harmony with those paid by other Government services and by private parties. Both measures tend directly to cheaper and better service. The wise provision by Congress of \$60,000 in an appropriation for aids to navigation in Alaska has permitted the taking of prompt steps for marking known dangers in those waters. Before, however, the coast of Alaska can be properly marked a vessel of sufficient size to keep the sea and do its work in rough weather must be provided. A former tender in Alaskan waters was wrecked upon an unknown rock. This was a needless waste of property, but there have been many more like it in those waters. Legislation is now pending to provide a suitable vessel.

It is with regret that as this report is written we are preparing to part with the Bureau of Corporations, which becomes the nucleus of the new Federal Trade Commission. That Bureau has been one of the valuable adjuncts of the Department. Its work has been done well but without excitement or the spirit of self-advertising. It has been a privilege to be associated with its staff, from its head downward, and the experience derived from pleasant personal association in a common work affords a sound basis for belief in the success of that service in its enlarged field.

The above survey is both brief and partial but gives a glance at the extent of the Department's work. The operations of each bureau are separately considered later.

The appropriations for the current fiscal year (ending June 30, 1915) provide for the use of the Department the sum of \$11,689,829.05. The estimates for the fiscal year ending June 30, 1916, including \$430,000 for printing and binding and exclud-

ing \$1,831,900 not directly estimated for public works for the Lighthouse Service, total \$17,201,095, an increase of \$5,511,265.95 over the appropriations for 1915.

The largest single item in the increased fund requested is the necessary provision for the census of agriculture, which is by law required to be taken in the year 1915-as of October 1. The sum required for this work is \$3,103,500. Another considerable item is the renewed request on behalf of the Coast and Geodetic Survey for three new vessels for Alaska and three small vessels (large launches) for wire-drag work and resurveys on the Atlantic coast. The statements made in my last report upon this subject are reaffirmed and are emphasized by the recent loss of the United States revenue cutter *Tahoma*, one further sacrifice to the uncharted dangers of Alaskan waters. Such sacrifices must and will continue until we deal with this problem as its importance requires. The subject is treated fully under the heading of the Coast and Geodetic Survey.

The plan for reorganizing and strengthening the Bureau of Foreign and Domestic Commerce, to which attention was given in detail in my last annual report, has been developed actively during the fiscal year 1914. Through the helpful action of Congress this important branch of the Department is now much more adequately equipped for useful and effective trade-promotion service than ever before. A number of new positions have been provided to reenforce the central office in Washington, and increased appropriations for the field service, both at home and abroad, are now available.

The United States is one of the three foremost commercial nations. It is essential to its prosperity that it should be inferior to no other country in its governmental system for the fostering and protection of its trade, both domestic and foreign. Such a system is now firmly established. In foreign countries the admirable trade-development work which the consular officers of the Department of State carry on is now to be supplemented through the service of a corps of commercial attachés, which will fill a gap heretofore existing in our organization as compared with that of other nations. These, with the group of special traveling investigators or commercial agents who continue the valuable technical studies of markets abroad, constitute for the first time in the foreign field a complete and well-balanced system of Federal aid to trade in foreign lands.

The country is to be congratulated that under existing conditions it has by the wise liberality of Congress been provided dur-

ing the past year not only with a well-rounded system of obtaining information abroad but with another for utilizing that information at home. The matter is treated in detail under the heading of the Bureau.

It is a pleasure to acknowledge the support of Congress in dealing with certain suggestions in my last report, and it is my belief that even more would have been done had Congress realized the exact facts. The American people do not, in my belief, understand that their Government is obliged for lack of money to buy old, secondhand vessels and use them in dangerous waters, at a high cost for repair and for services for which they were not designed. Neither the American people nor Congress desire that lives shall continue to be sacrificed when measures can be taken which will stop the sacrifice at trifling cost. In my belief, both Congress and the American people are willing to spend for needful work well done whatever that work requires for its reasonable performance. It is in this spirit that I shall lay before Congress again the estimates for this Department for the coming fiscal year.

There is so much talk about governmental extravagance that the people hardly understand that some of their services are run upon a basis that it would be lavish to call frugal. They do not want their officers who must stay at sea to be obliged to eat and sleep and wash in the same room as they are now obliged to do. They are just as anxious that their seamen shall have sufficient room and air in which to sleep as they are that their children shall be provided with air in schoolhouses. It has been suggested as perhaps a kindly criticism of administrative officers that they are properly enthusiastic over their own work, but no such disclaimer will do away with hard facts. When a steamer must do work at sea that has not sufficient power for steerageway in heavy weather, the risk and the responsibility can not lie upon this Department, but must rest with those to whom, when the facts are plainly stated, is given the honorable duty of providing funds that such conditions shall no longer exist.

Under the supervision of the Chief Clerk and Superintendent, the libraries formerly maintained by the several bureaus when separated have been consolidated. The library of the Bureau of the Census was the last one to be made a part of the general library, and the librarian of that Bureau has been placed in charge. The consolidation has already resulted in greater efficiency, and will save money by dispensing with the purchase of many duplicate copies of books and periodicals and with the

binding of duplicate copies of foreign publications, which was necessary when the various bureaus maintained separate libraries.

The Department has dispensed with the telegraph office formerly maintained by the Bureau of the Census. The telegraphic business of that Bureau is now handled in conjunction with the work of the general telegraph office of the Department. In like manner the private telephone exchange formerly maintained by the Bureau of the Census has been discontinued and its service consolidated with the Department switchboard. Through this action five distinct telephone lines and an operator have been saved.

In consolidating the carpenter shop formerly maintained by the Bureau of the Census, there was transferred to the carpenter shop of the Bureau of Standards machinery and equipment valued at approximately \$2,420 which it would otherwise have been necessary for the latter Bureau to purchase.

About 3 miles in length (15,265 linear feet) of dilapidated wooden shelving which was in use throughout the Department has been replaced with steel shelving. The Bureau of Foreign and Domestic Commerce has been furnished with steel vertical letter units.

The Department purchased during the fiscal year 132 typewriters, 99 for use in the District of Columbia and 33 for outside service. The total cost of these was \$9,357.40. The allowance for old machines given in exchange was \$2,827, making a net cash outlay for new machines of \$6,530.40, an average net cash price of \$49.47 paid for each machine.

The stable equipment of the Department formerly consisted of 11 horses, 5 wagons, 4 carriages, 1 runabout, 1 omnibus, and an electric truck. Through the union of the Department in one building this equipment has been gradually reduced so that the Department has now, in addition to the gasoline truck previously mentioned, but 5 horses, 4 carriages, 1 wagon, 1 omnibus, and 1 electric truck. This will be further reduced as soon as a new gasoline truck is delivered, for which an order has been placed, by 1 horse, 1 wagon, 1 omnibus, and the electric truck, which is nearly worn out. Coincident with this has been a reduction of rent for stable purposes from \$1,800 to \$1,000 per annum.

A special departmental messenger and mail service has been established between the Commerce Building, the Capitol, the several executive departments, and the Government Printing Office. All urgent mail from the various offices in the building is sent to the mail room on the first floor, where it is collected for delivery by special messengers, who leave the building every hour during the day.

Arrangements have been made for serving coffee and hot lunches on the third, sixth, and ninth floors of the Commerce Building during the luncheon period; and to avoid congestion in the halls and to serve the convenience of employees the office hours for the Bureau of the Census have been fixed at from 8.45 a. m. to 4.15 p. m., and those for other employees at from 9 a. m. to 4.30 p. m.

Appropriations and Expenditures.

The itemized statement of the disbursements from the contingent fund of the Department of Commerce and the appropriation for "General expenses, Bureau of Standards," for the fiscal year ended June 30, 1914, required to be submitted to Congress by section 193 of the Revised Statutes of the United States; the itemized statement of expenditures under all appropriations for propagation of food fishes during the fiscal year ended June 30, 1914, required by the act of Congress approved March 3, 1887 (24 Stat., 523); and a statement showing travel on official business by officers and employees (other than the special agents, inspectors, and employees in the discharge of their regular duties, who are required to travel constantly) from Washington to points outside of the District of Columbia during the fiscal year ended June 30, 1914, as required by the act of Congress approved May 22, 1908 (35 Stat., 244), will be transmitted to Congress in the usual form.

The following table shows the total amounts of all appropriations for the various bureaus and services of the Department of Commerce for the fiscal year ended June 30, 1914:

| Bureau. | Legislative act. | Sundry civil act. | Deficiency act. | Special acts. | Total. |
|--|---------------------|---------------------|-------------------|-----------------|----------------------|
| Office of the Secretary..... | \$281,480.00 | | \$6,562.68 | | \$288,042.68 |
| Bureau of Corporations..... | 253,300.00 | | | | 253,300.00 |
| Bureau of Lighthouses..... | 64,510.00 | \$5,007,420.00 | 724,985.69 | | 5,796,915.69 |
| Bureau of the Census..... | 1,122,820.00 | | 2,500.00 | | 1,125,320.00 |
| Bureau of Foreign and Domestic Commerce..... | 174,860.00 | | 50,000.00 | | 224,860.00 |
| Steamboat-Inspection Service.... | 534,740.00 | | 8,000.20 | | 542,740.20 |
| Bureau of Navigation..... | 160,510.00 | | | \$5,408.79 | 165,918.79 |
| Bureau of Standards..... | 555,940.00 | 45,000.00 | 2,000.74 | | 602,940.74 |
| Coast and Geodetic Survey..... | | 1,024,420.00 | 2.44 | | 1,024,422.44 |
| Bureau of Fisheries..... | | 1,087,180.00 | 1.10 | | 1,087,181.10 |
| Allotment for printing and binding..... | | \$525,000.00 | | | \$525,000.00 |
| Total..... | 3,148,160.00 | 7,689,020.00 | 794,052.85 | 5,408.79 | 11,636,641.64 |

^a Of this amount, \$50,497.50 was transferred to the Department of Labor.

^b Of this amount, \$84,000 was transferred to the Department of Labor.

The disbursements by the Disbursing Clerk of the Department of Commerce during the fiscal year ended June 30, 1914, arranged according to items of appropriation, are as follows:

OFFICE OF THE SECRETARY.

| | |
|--|---------------------|
| Salaries, Office of Secretary of Commerce, 1913..... | \$6, 130. 63 |
| Salaries, Office of Secretary of Commerce, 1914..... | 139, 619. 44 |
| Contingent expenses, Department of Commerce and Labor, 1912..... | 26. 53 |
| Contingent expenses, Department of Commerce, 1913..... | 27, 195. 08 |
| Contingent expenses, Department of Commerce, 1914..... | 65, 790. 90 |
| Rent, Department of Commerce, 1913..... | 4, 111. 84 |
| Rent, Department of Commerce, 1914..... | 51, 909. 73 |
| Total..... | <u>294, 784. 15</u> |

BUREAU OF CORPORATIONS.

| | |
|--|---------------------|
| Salaries, Bureau of Corporations, 1913..... | 3, 150. 12 |
| Salaries, Bureau of Corporations, 1914..... | 70, 296. 03 |
| Salaries and expenses, special attorneys, Bureau of Corporations, 1912.. | 1. 00 |
| Salaries and expenses, special attorneys, Bureau of Corporations, 1913.. | 6, 435. 11 |
| Salaries and expenses, special attorneys, Bureau of Corporations, 1914.. | 136, 195. 11 |
| Total..... | <u>216, 077. 37</u> |

BUREAU OF FOREIGN AND DOMESTIC COMMERCE.

| | |
|--|---------------------|
| Salaries, Bureau of Foreign and Domestic Commerce, 1913..... | 4, 366. 83 |
| Salaries, Bureau of Foreign and Domestic Commerce, 1914..... | 98, 931. 23 |
| Collating tariffs of foreign countries, 1913..... | 443. 90 |
| Collating tariffs of foreign countries, 1914..... | 9, 040. 94 |
| Promoting commerce, Department of Commerce, 1913..... | 3, 273. 96 |
| Promoting commerce, Department of Commerce, 1914..... | 20, 959. 67 |
| Investigating cost of production, Department of Commerce, 1914..... | 29, 079. 68 |
| Payment to Jose de Olivares (deficiency act approved June 25, 1910)..< | 13. 69 |
| Total..... | <u>166, 109. 90</u> |

BUREAU OF STANDARDS.

| | |
|--|--------------|
| Salaries, Bureau of Standards, 1913..... | 9, 707. 99 |
| Salaries, Bureau of Standards, 1914..... | 258, 550. 87 |
| Laboratory, Bureau of Standards..... | 25, 911. 74 |
| Equipment, Bureau of Standards, 1912..... | 16. 56 |
| Equipment, Bureau of Standards, 1913..... | 18, 993. 79 |
| Equipment, Bureau of Standards, 1914..... | 56, 759. 89 |
| General expenses, Bureau of Standards, 1912..... | 71. 29 |
| General expenses, Bureau of Standards, 1913..... | 3, 271. 58 |
| General expenses, Bureau of Standards, 1914..... | 19, 474. 91 |
| Investigating effects of electric currents, Bureau of Standards, 1912..... | 70. 20 |
| Investigating effects of electric currents, Bureau of Standards, 1913..... | 824. 45 |
| Testing machines, Bureau of Standards, 1913..... | 4, 138. 21 |
| Testing machines, Bureau of Standards, 1914..... | 24, 193. 46 |
| Testing structural materials, Bureau of Standards, 1912..... | 1. 25 |
| Testing structural materials, Bureau of Standards, 1913..... | 5, 808. 02 |
| Testing structural materials, Bureau of Standards, 1914..... | 69, 072. 97 |

| | |
|--|---------------------|
| Improvement and care of grounds, Bureau of Standards, 1913..... | \$401. 09 |
| Improvement and care of grounds, Bureau of Standards, 1914..... | 2, 888. 27 |
| Refrigeration constants, Bureau of Standards, 1913..... | 4, 994. 69 |
| Refrigeration constants, Bureau of Standards, 1914..... | 11, 466. 73 |
| Current meter testing tank, Bureau of Standards, 1913..... | 3, 694. 05 |
| Electrical laboratory equipment, Bureau of Standards, 1913-14..... | 22, 777. 17 |
| High-potential investigations, Bureau of Standards, 1914..... | 13, 756. 54 |
| Testing railroad scales, Bureau of Standards, 1914..... | 18, 573. 56 |
| Investigation of fire-resisting properties, Bureau of Standards, 1914..... | 8, 408. 54 |
| Workshop and storehouse, Bureau of Standards..... | 19, 578. 77 |
| Total..... | <u>603, 406. 59</u> |

BUREAU OF NAVIGATION.

| | |
|---|---------------------|
| Salaries, Bureau of Navigation, 1913..... | 1, 335. 87 |
| Salaries, Bureau of Navigation, 1914..... | 31, 615. 79 |
| Salaries, Shipping Service, 1913..... | 2, 481. 03 |
| Salaries, Shipping Service, 1914..... | 26, 668. 48 |
| Clerk hire, Shipping Service, 1913..... | 2, 919. 00 |
| Clerk hire, Shipping Service, 1914..... | 31, 489. 18 |
| Contingent expenses, Shipping Service, 1913..... | 1, 650. 80 |
| Contingent expenses, Shipping Service, 1914..... | 5, 198. 38 |
| Enforcement of navigation laws, 1913..... | 4, 745. 12 |
| Enforcement of navigation laws, 1914..... | 13, 666. 24 |
| Enforcement of wireless-communication laws, 1913..... | 9, 737. 31 |
| Enforcement of wireless-communication laws, 1914..... | 34, 065. 80 |
| Admeasurement of vessels, 1914..... | 1, 723. 27 |
| Total..... | <u>167, 296. 27</u> |

STEAMBOAT-INSPECTION SERVICE.

| | |
|--|---------------------|
| Salaries, Office of Supervising Inspector General, Steamboat-Inspection Service, 1913..... | 610. 03 |
| Salaries, Office of Supervising Inspector General, Steamboat-Inspection Service, 1914..... | 13, 884. 98 |
| Salaries, Steamboat-Inspection Service, 1913..... | 28, 502. 29 |
| Salaries, Steamboat-Inspection Service, 1914..... | 315, 256. 57 |
| Clerk hire, Steamboat-Inspection Service, 1913..... | 6, 880. 10 |
| Clerk hire, Steamboat-Inspection Service, 1914..... | 75, 550. 77 |
| Contingent expenses, Steamboat-Inspection Service (no year)..... | . 20 |
| Contingent expenses, Steamboat-Inspection Service, 1912..... | 2. 26 |
| Contingent expenses, Steamboat-Inspection Service, 1913..... | 11, 650. 29 |
| Contingent expenses, Steamboat-Inspection Service, 1914..... | 66, 040. 56 |
| Steamboat-Inspection Service, Los Angeles, Cal., 1914..... | 4, 008. 26 |
| Total..... | <u>522, 386. 34</u> |

BUREAU OF FISHERIES.

| | |
|--|--------------|
| Salaries, Bureau of Fisheries, 1913..... | 29, 338. 58 |
| Salaries, Bureau of Fisheries, 1914..... | 340, 775. 71 |
| Miscellaneous expenses, Bureau of Fisheries, 1912..... | 43. 40 |
| Miscellaneous expenses, Bureau of Fisheries, 1913..... | 61, 142. 34 |

| | |
|--|--------------|
| Miscellaneous expenses, Bureau of Fisheries, 1914..... | \$378,636.48 |
| Protecting seal fisheries of Alaska..... | 1,481.37 |
| Protecting seal and salmon fisheries of Alaska, 1913..... | 3,520.04 |
| Protecting seal and salmon fisheries of Alaska, 1913-14..... | 35,688.98 |
| Protecting seal and salmon fisheries of Alaska, 1914..... | 26,360.15 |
| Biological station, Mississippi River Valley..... | 5,886.35 |
| Marine biological station, Florida..... | 543.35 |
| Steamer <i>Albatross</i> , repairs, 1914..... | 39,283.00 |
| Payment to Great Britain and Japan..... | 20,000.00 |
| Distribution cars, Bureau of Fisheries, 1914..... | 63.73 |
| Philippine fisheries report..... | 642.30 |
| Fish hatcheries: | |
| Green Lake, Me..... | 504.28 |
| Kentucky..... | 17,108.67 |
| Puget Sound, Wash..... | 7,875.38 |
| South Carolina..... | 18,167.24 |
| Upper Mississippi Valley..... | 6,807.19 |
| Utah..... | 289.40 |
| West Virginia..... | 795.00 |
| Wyoming..... | 267.75 |
| Total..... | 995,220.69 |

BUREAU OF THE CENSUS.

| | |
|--|--------------|
| Salaries, Bureau of the Census, 1913..... | 28,762.46 |
| Salaries, Bureau of the Census, 1914..... | 664,022.85 |
| Collecting statistics, Bureau of the Census, 1913..... | 10,959.81 |
| Collecting statistics, Bureau of the Census, 1914..... | 361,907.13 |
| Cotton statistics, Bureau of the Census, 1913..... | 13.75 |
| Rent, Bureau of the Census, 1913..... | 1,750.00 |
| Rent, Bureau of the Census, 1914..... | 19,250.00 |
| Tabulating machines, Bureau of the Census, 1913..... | 736.74 |
| Tabulating machines, Bureau of the Census, 1914..... | 10,764.73 |
| Temporary clerks, Bureau of the Census, 1913..... | 8,086.67 |
| Expenses of the Thirteenth Census, 1910-12..... | 175.50 |
| Tobacco statistics, Bureau of the Census, 1914..... | 1,841.44 |
| Total..... | 1,108,271.08 |

BUREAU OF LIGHTHOUSES.

| | |
|---|-----------|
| Salaries, Bureau of Lighthouses, 1913..... | 2,787.64 |
| Salaries, Bureau of Lighthouses, 1914..... | 60,102.01 |
| General expenses, Lighthouse Service, 1912..... | 6,497.12 |
| General expenses, Lighthouse Service, 1913..... | 26,327.39 |
| General expenses, Lighthouse Service, 1914..... | 48,753.61 |
| Salaries, Lighthouse Service, 1913..... | 287.50 |
| Salaries, Lighthouse Service, 1914..... | 10,616.67 |
| Salaries, lighthouse vessels, 1914..... | 18,849.92 |
| Salaries, lighthouse vessels, 1912..... | 6.67 |
| Salaries, keepers of lighthouses, 1914..... | 19,828.24 |
| Aids to navigation, St. Marys River, Mich..... | 27,000.00 |
| Fort McHenry Channel Range Lights, Md..... | 28,228.41 |
| Sand Island Light Station, Ala..... | 13,135.49 |
| Thimble Shoal Light Station, Va..... | 39,927.11 |
| Tender for first lighthouse district..... | 1,077.07 |

| | |
|---|--------------|
| Tender for fifteenth lighthouse district..... | \$18,530.22 |
| Tender for engineer, third lighthouse district..... | 287.71 |
| Tender for engineer, sixth lighthouse district..... | 715.00 |
| Point Abino Light Vessel, Lake Erie..... | 51,146.28 |
| Light vessels for general service..... | 51,625.78 |
| Oil houses for light stations..... | 160.60 |
| Lighting Norfolk Harbor, Va..... | 12,663.70 |
| Detroit River lights, Mich..... | 29,641.60 |
| Brandywine Shoal Light Station, Del..... | 41,910.00 |
| Buffalo Breakwater, North End Light Station, N. Y..... | 6,335.00 |
| Kauai Island Light Station, Hawaii..... | 288.24 |
| Cape Fear River lights, N. C..... | 22,521.40 |
| Southwest Pass Light Vessel, Mississippi River, La..... | 150.00 |
| Total..... | 539,400.38 |
| Grand total..... | 4,612,952.77 |

The following statement shows the expenditures during the fiscal year ended June 30, 1914, on account of all appropriations under the control of the Department, giving the total amounts disbursed by the various disbursing officers of the Department and miscellaneous receipts for the same period:

| | |
|---|----------------|
| By the Disbursing Clerk, Department of Commerce, on account of salaries and expenses of the Office of the Secretary of Commerce, the Bureaus of Corporations, Foreign and Domestic Commerce, Navigation, Standards, Fisheries, and Lighthouses, the Office of the Supervising Inspector General, Steamboat-Inspection Service, salaries and expenses of Steamboat-Inspection Service at large, and public works of the Lighthouse and Fisheries Services (shown in detail in the foregoing table of disbursements)..... | \$4,612,952.77 |
| By the authorized disbursing officers of the Lighthouse Service..... | 4,943,710.37 |
| By the special disbursing agent, Coast and Geodetic Survey, on account of salaries and expenses of the Coast and Geodetic Survey..... | 991,271.48 |
| By the commercial agents of the Department investigating trade conditions abroad, as special disbursing agents..... | 47,840.54 |
| By special disbursing agents, Bureau of Fisheries..... | 30,371.69 |
| By warrants drawn on the Treasurer of the United States to satisfy accounts settled by the Auditor for the State and Other Departments, classified as follows: | |
| Office of the Secretary..... | \$296.85 |
| Bureau of Corporations..... | 22.15 |
| Foreign and Domestic Commerce..... | 2,431.19 |
| Bureau of Standards..... | 3,676.41 |
| Steamboat-Inspection Service..... | 125.14 |
| Bureau of Navigation..... | 6,403.60 |
| Bureau of Fisheries..... | 8,772.17 |
| Bureau of the Census..... | 123,400.54 |
| Bureau of Lighthouses..... | 206,458.54 |
| Coast and Geodetic Survey..... | 35,901.63 |
| Printing and binding..... | 387,488.22 |
| Total..... | 11,424,335.84 |

MISCELLANEOUS RECEIPTS, FISCAL YEAR 1914.

| | |
|---|-----------------|
| Coast and Geodetic Survey: Sale of Charts, Tide Tables, etc. | \$20, 951. 57 |
| Bureau of Standards: Standardizing and testing weights, etc. | 8, 158. 37 |
| Bureau of Navigation: | |
| Navigation fines. | 40, 741. 38 |
| Navigation fees. | 152, 694. 19 |
| Bureau of Fisheries: | |
| Sale of sealskins. | 51, 567. 61 |
| Sale of fox skins. | 17, 175. 00 |
| Treasury settlements. | 3, 780. 04 |
| Bureau of Lighthouses: Treasury settlements. | 3, 893. 93 |
| Proceeds of sale of condemned property, etc., by the Department. | 24, 919. 28 |
| Total | 323, 881. 37 |
| Other receipts: | |
| Annual yacht tax. | 446, 870. 50 |
| Tonnage tax. | 1, 310, 759. 03 |
| Grand total. | 2, 081, 510. 90 |

The following unexpended balances of appropriations were turned into the surplus fund June 30, 1914, in accordance with the act of June 20, 1874 (18 Stat., 110-111):

| | |
|---|--------------|
| Salaries, Office of Secretary of Commerce and Labor, 1912. | \$2, 725. 15 |
| Salaries and expenses, commercial agents, Department of Commerce and Labor, 1911. | 6. 45 |
| Salaries and expenses, commercial agents, Department of Commerce and Labor, 1912. | 7, 220. 33 |
| Rent, Department of Commerce and Labor, 1910. | 1. 25 |
| Rent, Department of Commerce and Labor, 1912. | 2, 404. 61 |
| Contingent expenses, Department of Commerce and Labor, 1912. | 5, 699. 10 |
| Salaries, Bureau of Corporations, 1912. | 5, 081. 42 |
| Salaries and expenses, special attorneys, etc., Bureau of Corporations, 1912. | 39, 987. 81 |
| Expenses of the Thirteenth Census, 1910-12. | 626. 92 |
| Salaries, Bureau of Manufactures, 1912. | 316. 00 |
| Salaries, Bureau of Statistics, 1912. | 365. 56 |
| Collecting statistics relating to commerce, 1912. | 197. 43 |
| Collating tariffs of foreign countries, 1912. | 758. 96 |
| Salaries, Office of Supervising Inspector General, Steamboat-Inspection Service, 1912. | 132. 78 |
| Salaries, Steamboat-Inspection Service, 1912. | 2, 544. 60 |
| Clerk hire, Steamboat-Inspection Service, 1912. | 815. 35 |
| Contingent expenses, Steamboat-Inspection Service, 1912. | 10, 100. 67 |
| Salaries, Bureau of Navigation, 1912. | 731. 93 |
| Salaries, Shipping Service, 1912. | 1, 308. 16 |
| Clerk hire, Shipping Service, 1912. | 218. 31 |
| Contingent expenses, Shipping Service, 1912. | 538. 36 |
| Instruments for measuring vessels and counting passengers, 1912. | 301. 14 |
| Enforcement of navigation laws, 1912. | 204. 19 |
| Enforcement of wireless communication laws, 1912. | 39. 81 |
| Salaries, Bureau of Standards, 1912. | 12, 289. 04 |
| Equipment, Bureau of Standards, 1912. | 1, 440. 61 |
| General expenses, Bureau of Standards, 1912. | 403. 82 |

| | |
|--|--------------|
| Improvement and care of grounds, Bureau of Standards, 1912..... | \$107. 07 |
| Investigating effects of electric currents, Bureau of Standards, 1912..... | 122. 69 |
| Testing machines, Bureau of Standards, 1912..... | 222. 08 |
| Testing structural materials, Bureau of Standards, 1912..... | 70. 33 |
| Salaries, Coast and Geodetic Survey, 1912..... | 4, 475. 47 |
| Party expenses, Coast and Geodetic Survey, 1911-12..... | 13, 227. 65 |
| Party expenses, Coast and Geodetic Survey, 1912..... | 5, 138. 91 |
| General expenses, Coast and Geodetic Survey, 1912..... | 502. 59 |
| Pay, etc., of officers and men, vessels, Coast Survey, 1912..... | 22, 447. 42 |
| Repairs of vessels, Coast Survey, 1912..... | 920. 50 |
| Salaries, Bureau of Lighthouses, 1912..... | 701. 65 |
| General expenses, Lighthouse Service, 1912..... | 21, 827. 13 |
| Salaries, keepers of lighthouses, 1912..... | 16, 001. 56 |
| Salaries, lighthouse vessels, 1912..... | 70, 354. 45 |
| Salaries, Lighthouse Service, 1912..... | 26, 081. 22 |
| Expenses of buoyage, 1911..... | 248. 63 |
| Expenses of light vessels, 1911..... | 108. 20 |
| Edgemoor lighthouse depot, Del..... | 31. 57 |
| Bogue Sound Range Light, N. C..... | 234. 31 |
| Frying Pan Shoal Light Vessel, N. C..... | 10, 860. 38 |
| Sand Island Light Station, Ala..... | 791. 16 |
| North Point Light Station, Wis..... | 417. 85 |
| Barge for lighthouse depot, St. Joseph, Mich., 1911-12..... | 7, 000. 00 |
| Point Loma Light Station, Cal..... | 50. 14 |
| San Pedro Breakwater Light Station, Cal..... | 635. 55 |
| Battery Point fog signal, Wash..... | 363. 52 |
| Relief light vessel for ninth and eleventh lighthouse districts..... | 194. 40 |
| Salaries, Bureau of Fisheries, 1912..... | 13, 352. 07 |
| Miscellaneous expenses, Bureau of Fisheries, 1912..... | 19, 367. 95 |
| Protecting seal and salmon fisheries of Alaska, 1911-12..... | 2, 216. 59 |
| Protecting the sponge fisheries, 1912..... | 4, 800. 60 |
| Biological station, Mississippi River Valley..... | 268. 16 |
| Marine biological station, North Carolina..... | 1. 78 |
| Fish hatchery, Green Lake, Me..... | 449. 26 |
| Fish hatchery, West Virginia..... | 17. 03 |
| Steam vessel for Alaska..... | 7, 000. 00 |
| Steamer <i>Fish Hawk</i> , repairs..... | 92. 85 |
| Total..... | 347, 162. 48 |

Personnel.

The creation of the Department of Labor had the effect of taking away from the Appointment Division the general supervision over the appointment work of a personnel consisting of 1,827 employees. This caused a small reduction in the force of the Division, which reduction has been partly met, however, by the transfer to the Secretary's roll of employees who had been serving by detail from the Bureau of the Census. The net reduction in the salary roll at the close of the fiscal year amounted to \$2,340, with no details from the various bureaus. The increasing demands for information, the frequent changes in the personnel, and the adop-

tion of additional safeguards designed to protect the Government's interests more than counterbalance any saving which has been effected by the introduction of improved and more economical methods of operation.

The accompanying table shows by bureaus the number of permanent positions in the Department on July 1, 1914, and the increase or decrease in each bureau as compared with July 1, 1913. The figures do not include temporary appointments, nor do they include the following appointments or employments not made by the head of the Department: Persons engaged in rodding, chaining, recording, heliotroping, etc., in field parties of the Coast and Geodetic Survey; temporary employments in field operations of the Bureau of Fisheries; mechanics, skilled tradesmen, and laborers employed under authority of Schedule A, Subdivision I, section 12, of the civil-service rules in the Lighthouse Service. Enlisted men on vessels of the Coast Survey in the Philippines, paid by the insular government of the Philippine Islands, are also excluded. The total of these excluded miscellaneous employments and enlistments is approximately 9,482.

| Bureau. | Statutory. | Non-statutory. | Total. | In District of Columbia. | Outside District of Columbia. | Increase (+) or decrease (-). |
|--|------------|----------------|--------|--------------------------|-------------------------------|-------------------------------|
| Office of the Secretary..... | 126 | ..... | 126 | 126 | ..... | - 13 |
| Bureau of the Census..... | 621 | 736 | 1,377 | 640 | 737 | + 1 |
| Bureau of Corporations..... | 63 | 70 | 133 | 133 | ..... | + 6 |
| Bureau of Foreign and Domestic Commerce..... | 83 | 37 | 120 | 94 | 26 | + 12 |
| Bureau of Standards..... | 230 | 108 | 338 | 296 | 42 | + 26 |
| Bureau of Fisheries..... | 392 | 5 | 397 | 80 | 317 | - 1 |
| Bureau of Lighthouses..... | 57 | 5,563 | 5,620 | 42 | 5,578 | - 4 |
| Coast and Geodetic Survey..... | 246 | 482 | 728 | 264 | 464 | + 381 |
| Bureau of Navigation..... | 40 | 61 | 101 | 28 | 73 | + 6 |
| Steamboat-Inspection Service..... | 196 | 69 | 265 | 9 | 256 | + 3 |
| Total..... | 2,054 | 7,151 | 9,205 | 1,712 | 7,493 | + 417 |

^a Includes 372 enlisted men on vessels who in previous reports have been included under miscellaneous employments. The actual increase in the force was 9 persons, employed under lump appropriations.

The following table gives a summary of changes in the personnel of the Department during the fiscal year ended June 30, 1914:

| Bureau. | Appointments, etc. | | | Separations. | | | Miscellaneous changes. | | |
|---|--------------------|----------------------|--------|---|--|--------|------------------------|-----------------------|--------------------------|
| | Perma- nent. | Tem- po- rary. | Total. | From perma- nent posi- tions. | From tem- po- rary posi- tions. | Total. | Prom- otions. | Re- duc- tions. | Mis- cella- neous. |
| Office of the Secretary..... | 30 | 2 | 32 | 25 | 3 | 28 | 14 | 1 | 3 |
| Bureau of the Census..... | 616 | 12 | 628 | 608 | 1 | 609 | 88 | 16 | 40 |
| Bureau of Corporations..... | 22 | 2 | 24 | 14 | 1 | 15 | 54 | ..... | ..... |
| Bureau of Foreign and Do- mestic Commerce..... | 44 | 33 | 77 | 25 | 17 | 42 | 35 | 4 | 27 |
| Bureau of Standards..... | 113 | 38 | 151 | 40 | 42 | 92 | 131 | 1 | 78 |
| Bureau of Fisheries..... | 69 | 28 | 97 | 55 | 16 | 71 | 45 | 12 | 40 |
| Bureau of Lighthouses..... | 324 | 110 | 434 | 305 | 104 | 409 | 301 | 95 | 197 |
| Coast and Geodetic Survey.. | 57 | 57 | 114 | 38 | 44 | 82 | 118 | 6 | 40 |
| Bureau of Navigation..... | 22 | 11 | 33 | 13 | 12 | 25 | 12 | ..... | 11 |
| Steamboat-Inspection Ser- vice..... | 15 | 4 | 19 | 15 | 2 | 17 | 10 | 1 | 5 |
| Total..... | 1,312 | 297 | 1,609 | 1,147 | 242 | 1,389 | 808 | 136 | 444 |

Vacancies in presidential positions have been filled during the fiscal year ended June 30, 1914, as follows:

| Position. | Compensa- tion. | Authority. |
|---|--------------------|----------------|
| Director of the Census ^a | \$6,000 | 32 Stat., 51. |
| Superintendent of naval construction, Bureau of Lighthouses ^b | 3,000 | 36 Stat., 227. |
| Supervising inspector, fifth district, Steamboat-Inspection Service, with headquarters at Boston, Mass. | 3,000 | R. S., 4404. |
| Supervising inspector, sixth district, Steamboat-Inspection Service, with headquarters at Louisville, Ky. ^c | 3,000 | Do. |

^a Appointment confirmed by the Senate, June 26, 1913, and appointee commissioned on same date. Assumed office July 1, 1913.

^b Position filled by transfer of a classified competitive employee in the Lighthouse Service. Confirmation by Senate not required.

^c Position filled by promotion of a classified competitive employee in the same service.

Since the end of the fiscal year three presidential appointments have been made, namely, Chief of the Bureau of Foreign and Domestic Commerce, (First) Assistant Chief of the Bureau of Foreign and Domestic Commerce, and (Second) Assistant Chief of the Bureau of Foreign and Domestic Commerce. Two of the appointees originally entered the service through competitive civil-service examination.

In considering recommendations for promotions the Department in the past has utilized its efficiency records, which were obtained as a result of the investigations made in 1906, 1909, and 1911. No investigation has been made since 1911, because

Congress has imposed upon the Civil Service Commission the duty of establishing an efficiency system for the various executive departments; and as the commission has not yet established such a system, the Department has no current efficiency records which might be used for the purpose stated. It can and does, of course, consider the ratings taken in 1911, but only to a limited extent, owing to the numerous changes which have since occurred. It is the practice to give very close attention to the merits of individual cases as submitted by bureau chiefs, who, in addition to any special reasons which exceptional cases may involve, support their recommendations by a certificate to the effect that the records of the various employees have been carefully considered, and that the persons recommended are most entitled to advancement by reason of their superior efficiency and the character of work on which they are engaged. The policy of this Department to select officers and employees from the lower grades to fill vacancies in higher positions, whenever practicable, is proving an incentive to increased efficiency.

By reason of the removal of the Bureau of the Census to the Commerce Building the labor, watch, char, and engineer forces of this Bureau and the Office of the Secretary were consolidated, and it became necessary, therefore, to dispense with 28 subclerical positions in the Census Bureau at the close of the fiscal year. The Department, as early as April 9, 1914, took up the question of providing for 25 employees (still remaining) whose services would not be required after June 30, 1914. At the close of the fiscal year 24 of these employees had been provided for.

The Department of the Interior during the early part of the present calendar year invited attention to the contemplated reduction in the clerical and examining forces of the Bureau of Pensions, and requested that consideration be given to the matter of transferring some of the employees whose services in that bureau would probably be discontinued by operation of law on July 1, 1914; also to other employees who could be transferred advantageously from that bureau to suitable positions in this Department. At the close of the year five of the employees of the Bureau of Pensions had been provided for in this Department.

In the reorganization of the force of the Bureau of Foreign and Domestic Commerce, to meet the terms of the legislative, executive, and judicial appropriation act for the fiscal year 1915, the number of subclerical employees was reduced from 11 to 5, thus abolishing

6 subclerical positions. While the bill was pending in Congress steps were taken along the same lines as in the case of the Census employees, with the view of making provision for the 6 employees affected.

In spite of the occasional loss of aged employees, due usually to death or resignation, superannuation still increases, thus accentuating the disadvantages of an impaired service, the discouragement of a retarded rate of promotion for young and deserving employees, and the feeling of unrest and perhaps dread of dismissal by those who are aware of the fact that the best service they are able to render does not reach the average standard of the younger employees of the same class and grade. While superannuation probably exists, it has been found difficult under present conditions to obtain admissions of the actual conditions from the higher officials under whom aged employees serve. Naturally, so far as may conscientiously be done, officials are reluctant to make any statement which might lead to the separation from the service of those who have given the best years of their lives to the Government and who, if deprived of their income, would face poverty and want.

In both governmental and commercial centers retirement on some system of pensions for superannuated employees is becoming more generally recognized as both a practical and profitable movement. That such a policy can be carried out by the Government so as to be ultimately a means of economy seems to have been demonstrated. A system of retirement has been adopted by the leading Governments of Europe, and its growth among business corporations indicates the value of the results accruing from the policy. It is found to effect not only immediate relief, but its benefits are seen in its influence on the younger and more active class of employees. It removes much of the incentive to seek other employment where the prospects are brighter; it induces many to render more nearly the maximum of service; and improves the esprit de corps when it is known that the faithful employees may expect to be cared for after they have become incapacitated in the service.

The act of January 16, 1883, to regulate and improve the civil service of the United States provided, among other things, for the classification of all the offices, places, and employments to which it was applicable, for open competitive examinations, selection and appointment according to grade from the persons

graded highest, and the apportionment of appointments in the departments at Washington among the several States and Territories and the District of Columbia, upon the basis of population as ascertained at the last preceding census. The intent of the framers of the act to insure an efficient administration of the affairs of the Government would seem to be shown in the declaration that appointments shall be apportioned as nearly as the conditions of good administration will warrant. In order to insure efficient administration, it is essential that nominating officers have before them at the time of making selection for appointment the names of well-qualified eligibles. The efficiency of the personnel is an important factor in an economical administration of public affairs, and it is not believed that the theory of a geographical division of appointments should be carried out to such a degree as to preserve an ideal the efficacy of which has long been questioned.

It is perhaps unfortunate from an administrative point of view that the interpretation placed at one time upon the law of apportionment has been such that in some cases it has been necessary to select for appointment eligibles with comparatively low ratings when there were on the register the names of persons with higher ratings who, under the apportionment law and rule, were not considered as available for certification. The exhaustive investigation in 1913 of the Civil Service Commission's methods of preserving an apportionment of appointments, made by the President's Commission on Economy and Efficiency, showed that a rigid division of appointments among the several States and Territories, according to population, was not in the interests of the service, and this commission recommended a plan of apportionment whereby the ratings of the eligibles as well as the condition of the apportionment would determine the question of priority of certification for appointment. A modification of the principle previously in force had already been adopted by the Civil Service Commission for certain positions of a scientific and technical nature and this was afterwards extended, probably as the result of the report of the President's commission, to other positions, although not to the extent recommended. The change seems to have worked an improvement in the personnel of the service.

On December 5, 1913, the Department issued a circular relating to the forms of political activity forbidden by the civil-service law and rules, and the illegal collection or payment of political assess-

ments. The circular was based upon the prohibition contained in civil-service Rule I, section 1, which reads as follows:

No person in the executive civil service shall use his official authority or influence for the purpose of interfering with an election or affecting the results thereof. Persons who by the provisions of these rules are in the competitive classified service, while retaining the right to vote as they please and to express privately their opinions on all political subjects, shall take no active part in political management or in political campaigns.

The application of this rule, particularly its application to the forms of political activity which are forbidden, were carefully explained, and reference was made to the sections of the Criminal Code prohibiting a Federal officer or employee from being concerned in soliciting or receiving a political assessment, subscription, or contribution from any other Federal officer or employee. It has been the wish of the Department to apply the rule and statutes referred to, and a copy of the circular is furnished to each employee at the time of his appointment. Three complaints of alleged political activity were filed against employees of the Department during the year. Upon investigation the complaints were not sustained.

Printing and Binding.

The publications of the Department have a wide range and include subjects within the fields of science, industry, shipping, trade, business management, finance, and statistics, but all clearly classifiable under the general head of commerce.

In the bill to revise the laws relating to public printing and binding, now before Congress, it is proposed to establish in each executive department and independent Government establishment a division of publications, with duties identical with those which at the organization of this Department were assigned to and have ever since been performed by its Division of Publications. This proposed action by Congress may reasonably be construed as expert testimony to the wisdom displayed by the Department of Commerce in its formative period in establishing such an office under the immediate head of the Department, and giving this office control over its publication work and over all expenditures for the same, thus insuring uniformity in the typographical form and style of its publications and economy in the expenditure of the Department's annual allotment for printing and binding. Briefly, the Division of Publications is charged with the conduct of the business which the Department transacts with the Gov-

ernment Printing Office, and with general supervision over all printing for the Department, including editing and preparing copy, illustrating and binding, and keeping records of expenditures. It has in charge the distribution of publications, the maintenance of mailing lists, the advertising done by the Department, and the correspondence which these duties entail.

The allotment to the Department for printing and binding during the fiscal year 1914 was \$525,000. Of this sum \$84,000 was on June 30, 1913, transferred to the Department of Labor, in accordance with the requirements of the act approved May 1, 1913. There remained, therefore, a balance of \$441,000 available for the Department of Commerce, of which \$410,700.77 was expended, leaving an unused balance on June 30 of \$30,299.23.

The increase in expenditures in 1914 over those in 1913 was \$80,725.85, or 24.46 per cent. Expenditures in 1914, however, include \$110,758.32 expended for the Bureau of the Census, while there was expended for that Bureau during the preceding year only \$38,270.24, other expenditures in 1913 being from appropriations for the Thirteenth Decennial Census. Excluding figures for the Bureau of the Census in both years, the increase in expenditures was but \$8,237.77, or 2.82 per cent.

The estimated cost of unbilled and uncompleted work of the Department at the Government Printing Office on July 1, 1914, was \$42,953.41, while the actual cost of such work at that office on the same date in 1913 was \$36,686.50..

During the year the Department issued on the Public Printer 3,084 requisitions for printing and binding, as compared with 2,735 in 1913, an increase of 349. Of the requisitions issued in 1914 there remained at the close of business on June 30, 1914, 355 upon which deliveries of completed work had not been made, compared with 344 on the same date in 1913.

The following table shows the cost of printing and binding for each of the bureaus, offices, and services of the Department during the fiscal years 1913 and 1914, together with the increase or decrease for each bureau, office, and service and the estimated cost of the work on hand but not completed June 30, 1914:

| Bureau, office, or service. | Cost of work delivered. | | Increase (+) or decrease (-). | | Estimated cost of work not completed June 30, 1914. |
|--|-------------------------|-------------------|-------------------------------|----------------|---|
| | 1913 | 1914 | Cost. | Per cent. | |
| Office of the Secretary..... | \$19,408.28 | \$12,655.94 | -\$6,752.34 | - 34.79 | \$828.45 |
| Appointment Division..... | 396.05 | 383.58 | - 12.47 | - 3.15 | 58.54 |
| Disbursing Office..... | 1,133.42 | 698.09 | - 435.33 | - 38.44 | ..... |
| Division of Supplies..... | 363.75 | 505.43 | + 141.68 | + 38.95 | 6.30 |
| Bureau of the Census..... | 38,270.24 | 110,758.32 | +72,488.08 | +189.41 | 12,730.72 |
| Coast and Geodetic Survey..... | 26,526.52 | 28,837.49 | + 2,310.97 | + 8.71 | 3,783.51 |
| Bureau of Corporations..... | 11,524.50 | 10,468.46 | - 1,056.04 | - 9.16 | 3,155.75 |
| Bureau of Fisheries..... | 12,897.91 | 12,687.49 | - 210.42 | - 1.63 | 2,346.99 |
| Bureau of Foreign and Domestic Commerce..... | 142,818.07 | 132,039.95 | -10,778.12 | - 7.55 | 5,948.76 |
| Bureau of Lighthouses..... | 20,219.62 | 25,560.31 | + 5,340.69 | + 26.41 | 2,990.51 |
| Lighthouse Service..... | 6,716.44 | 7,298.93 | + 582.49 | + 8.67 | 733.25 |
| Bureau of Navigation..... | 12,130.37 | 12,473.34 | + 342.97 | + 2.83 | 113.97 |
| Shipping Service..... | 2,032.81 | 2,646.77 | + 613.96 | + 30.20 | 393.34 |
| Radio Service..... | 1,102.21 | 893.83 | - 208.38 | - 18.91 | 76.07 |
| Bureau of Standards..... | 18,278.49 | 28,033.31 | + 9,754.82 | + 53.37 | 3,973.54 |
| Office Supervising Inspector General, | | | | | |
| Steamboat-Inspection Service..... | 2,456.71 | 2,637.22 | + 180.51 | + 7.35 | 10.58 |
| Steamboat-Inspection Service..... | 6,767.34 | 8,768.90 | + 2,001.56 | + 29.58 | 3,582.05 |
| Customs Service..... | 6,932.19 | 13,353.41 | + 6,421.22 | + 92.63 | 2,221.08 |
| Total..... | \$329,974.92 | 410,700.77 | +80,725.85 | + 24.46 | 42,953.41 |

* In 1913 the allotment to the Department for printing and binding was reimbursed from other appropriations for the following expenditures: For the Radio Service, \$1,716.58; for the Bureau of the Census for printing in connection with publishing statistics relating to cotton and tobacco, \$5,011.48; total, \$6,728.06.

It is worthy of note that though the work of the Department has expanded in recent years its expenditures for printing and binding have remained practically stationary. This is evidenced by the following statement, which shows for each of the fiscal years 1907 to 1914 the amount available to the Department for printing and binding, the amount expended, the unused balance on June 30, and the cost of work not completed at the close of the year. Figures prior to 1913 include expenditures for bureaus and services transferred to the Department of Labor by the act of March 4, 1913, but do not include those for the Bureau of the Census, which was provided for by separate allotments or appropriations.

| Fiscal year. | Allotment. | Expenditures. | Unused balance. | Cost of work not completed June 30. |
|--------------|-------------------------|-------------------------|-----------------|-------------------------------------|
| 1907..... | \$375,000.00 | \$332,185.05 | \$42,814.95 | \$34,749.84 |
| 1908..... | 375,000.00 | 349,962.36 | 32,037.64 | 47,055.59 |
| 1909..... | 375,000.00 | 374,939.91 | 60.09 | 99,139.86 |
| 1910..... | ^a 376,337.43 | ^a 361,530.43 | 14,807.00 | 49,535.93 |
| 1911..... | ^b 381,500.00 | ^b 375,575.02 | 5,924.98 | 46,173.12 |
| 1912..... | 375,000.00 | 374,995.64 | 4.36 | 43,956.76 |
| 1913..... | ^c 329,978.06 | ^c 329,974.92 | 3.14 | 36,686.50 |
| 1914..... | 441,000.00 | 410,700.77 | 30,299.23 | ^d 42,953.41 |

^a Includes \$1,337.43 expended for supplies furnished the Bureau of the Census, for which the Department's allotment was reimbursed.

^b Includes a special appropriation of \$6,500 for the printing of the World Trade Directory. The entire sum was expended for the publication.

^c Includes \$6,728.06 for printing done for the Bureau of the Census (publishing statistics relating to cotton and tobacco) and the Bureau of Navigation (Radio Service), for which the Department's allotment was reimbursed.

^d Estimated.

The following statement shows the amount and cost of each class of work called for by requisitions on the Public Printer during the fiscal year 1914, and affords a comparison with the amount and cost of these classes during the preceding fiscal year:

| Class. | 1913 | 1914 | Increase (+) or decrease (-). | |
|--|----------------|----------------|-------------------------------|------------------|
| | <i>Number.</i> | <i>Number.</i> | <i>Number.</i> | <i>Per cent.</i> |
| Blank forms..... | 8,409,705 | 14,301,618 | + 5,891,913 | + 70.06 |
| Reports, pamphlets, etc..... | 7,287,545 | 7,634,930 | + 347,385 | + 4.77 |
| Letterheads..... | 1,171,500 | 1,769,500 | + 617,500 | + 52.71 |
| Envelopes..... | 35,045 | 347,250 | + 312,205 | +890.87 |
| Circulars, notices, and summaries..... | 155,150 | 799,875 | + 574,725 | +370.43 |
| Index cards..... | 553,700 | 1,620,200 | + 1,066,500 | +192.61 |
| Guide cards and folders..... | 145,650 | 152,700 | + 7,050 | + 4.84 |
| Memorandum sheets..... | 4,686,000 | 1,525,000 | - 3,161,000 | - 67.46 |
| Blank books..... | 27,735 | 13,355 | - 14,380 | - 51.85 |
| Miscellaneous books (binding)..... | 2,575 | 4,530 | + 1,955 | + 75.92 |
| | <i>Cost.</i> | <i>Cost.</i> | <i>Cost.</i> | <i>Per cent.</i> |
| Blank forms..... | \$32,954.51 | \$45,226.19 | +\$12,271.68 | + 37.24 |
| Reports, pamphlets, etc..... | 274,562.23 | 338,247.73 | + 63,685.50 | + 23.20 |
| Letterheads..... | 1,512.23 | 2,962.95 | + 1,450.72 | + 95.93 |
| Envelopes..... | 159.32 | 311.61 | + 152.29 | + 95.59 |
| Circulars, notices, and summaries..... | 754.71 | 3,594.09 | + 2,839.38 | +376.22 |
| Index cards..... | 685.50 | 1,339.47 | + 653.97 | + 95.40 |
| Guide cards and folders..... | 782.91 | 740.27 | - 42.64 | - 5.45 |
| Memorandum sheets..... | 2,334.28 | 1,214.55 | - 1,119.73 | - 47.97 |
| Blank books..... | 10,549.95 | 10,591.99 | + 42.04 | + .40 |
| Miscellaneous books (binding)..... | 4,160.86 | 5,890.27 | + 1,729.41 | + 41.26 |
| Miscellaneous..... | 1,509.42 | 581.65 | - 927.77 | - 61.47 |
| Total..... | 329,974.92 | 410,700.77 | + 80,725.85 | + 24.46 |

During the fiscal year 1914 the Department issued 1,054 publications, compared with 843 for the same bureaus and offices in the fiscal year 1913, of which 53, against 23 in 1913, were printed in two or more editions during the year, while 110, compared with 73 last year, were reprints, without change, of issues of earlier years. The publications issued in 1914 contained a total of 54,768 printed pages, compared with 41,507 in 1913, and there were printed of them for the Department a grand total of 8,586,605 copies, against 7,286,930 in the preceding year, an increase of 1,299,675 copies.

The publication work of each bureau of the Department for the past two fiscal years is summarized in the following table:

| Bureau. | Publications. | | Pages. | | Copies printed for Department. | | Cost. | |
|--|---------------|-------|--------|--------|--------------------------------|-----------|------------|------------|
| | 1913 | 1914 | 1913 | 1914 | 1913 | 1914 | 1913 | 1914 |
| Office of the Secretary..... | 30 | 56 | 2,560 | 2,090 | 92,850 | 197,050 | \$8,040.47 | \$6,435.78 |
| Bureau of the Census..... | 30 | 198 | 2,247 | 12,976 | 191,700 | 1,056,950 | 48,766.20 | 98,306.41 |
| Coast and Geodetic Survey... | 25 | 25 | 2,070 | 4,674 | 31,500 | 55,125 | 16,561.04 | 32,782.08 |
| Bureau of Corporations..... | 19 | 15 | 3,954 | 3,136 | 33,225 | 16,990 | 14,553.78 | 3,672.45 |
| Bureau of Fisheries..... | 49 | 53 | 2,516 | 2,516 | 44,225 | 90,100 | 12,494.91 | 10,496.77 |
| Bureau of Foreign and Domestic Commerce..... | 428 | 425 | 16,343 | 16,220 | 6,264,435 | 6,242,470 | 135,270.79 | 121,820.68 |
| Bureau of Lighthouses..... | 105 | 108 | 3,147 | 3,432 | 256,695 | 279,020 | 22,087.51 | 25,791.17 |
| Bureau of Navigation..... | 16 | 19 | 2,239 | 2,036 | 74,600 | 42,100 | 10,998.50 | 11,817.41 |
| Bureau of Standards..... | 108 | 145 | 5,272 | 6,895 | 86,700 | 129,300 | 12,857.91 | 19,553.30 |
| Steamboat-Inspection Service..... | 13 | 10 | 1,159 | 793 | 211,000 | 477,500 | 6,511.71 | 7,295.61 |
| Total..... | 843 | 1,054 | 41,507 | 54,768 | 7,286,930 | 8,586,605 | 288,142.82 | 337,971.60 |

* Figures relate to publications actually becoming available during the year for distribution; consequently they do not agree with similar figures in a preceding table giving the cost of work done by the Government Printing Office during the fiscal year. Frequently the cost of a publication is charged against allotments for two or more fiscal years.

During the year 7,035,029 publications and printed circulars of the Department were distributed to the public, as compared with a total of 7,107,199 during the fiscal year 1913, a decrease of 72,170. This decrease was due to two causes—(1) revisions of mailing lists, which resulted in the removal of a large number of names, and (2) an extension of the Department's policy to curtail the promiscuous free distribution of its publications. Of the total number of publications and circulars distributed, 6,803,123 were wrapped and mailed by the office of the Superintendent of Documents and 231,906 by the Division of Publications. Those wrapped and mailed by the Superintendent of Documents com-

prised a mailing list distribution of 6,507,834 and a distribution in response to individual requests of 295,289.

During the year the Department received and acted on 85,170 miscellaneous requests, calling for 484,331 copies of publications. This was an average of 278 requests and nearly 1,600 publications for each working day.

The number of publications of the Department in stock and available for distribution to the public on July 1, 1913, was 340,005, to which were added during the year 7,037,764, making a total of 7,377,769. Of this total, 7,035,029 were distributed during the year, leaving 342,740 on hand at the close of business June 30, 1914.

In consonance with the policy of the Department to place its publications on a sales basis, so far as practicable, and to limit free distribution to well-defined public or quasi-public classes, the free distribution of practically all publications of the Bureau of Foreign and Domestic Commerce is now confined to libraries, educational institutions, the press, and commercial or other organizations. Editions of the Bureau's publications have been reduced, and individuals requesting copies are referred to the Superintendent of Documents, who maintains an ample stock for sale at nominal prices based on the cost of printing from stereotype plates. Publications of the Bureau which are sold either on a subscription basis or at a flat rate include the Daily Consular and Trade Reports, Monthly Summary of the Foreign Commerce of the United States, Quarterly Statement of Imported Merchandise Entered for Consumption, Statistical Abstract of the United States, annual report on the Foreign Commerce and Navigation of the United States, Commercial Relations of the United States with Foreign Countries, reports of special agents sent abroad to investigate trade conditions with respect to selected industries, and special reports of consular officers on assigned subjects.

The Bulletin of the Bureau of Standards (issued four times a year) is also now sold by the Superintendent of Documents at 25 cents per number, or \$1 for the four numbers constituting a volume, all back numbers of the Bulletin being available. The Department edition has been reduced from 2,500 to 1,500 copies.

It is believed that the present free distribution of large and expensive editions of the light lists and buoy books of the Bureau of Lighthouses could also be curtailed without detriment to the interests served. Other governments put a price on similar publications issued by them. There is, however, some question as to a practical plan for the distribution. Tide Tables, Coast Pilots,

and Charts, which have for many years been issued and sold by the Coast and Geodetic Survey, may be conveniently purchased by mariners at agencies established at all important ports on the seacoast and the Great Lakes. The publications of the Bureau of Lighthouses should, of course, be procurable with equal facility, but it is doubtful if the Superintendent of Documents at present has authority for establishing the necessary number of agencies and supplying them with stock. Some specific legislation may therefore be necessary before the sales plan may be adopted for these publications.

The results have been so gratifying that further gradual extensions of the sales plan are in contemplation, as it is believed to furnish the most equitable and economical distribution of the Department's many publications. Experience has demonstrated that persons are willing to pay the merely nominal prices placed on the publications by the Superintendent of Documents, and when distributed under this plan the Department has a reliable method for judging the public demand for its publications and knows that they are reaching persons who have a real interest in them.

Sales by the Superintendent of Documents during each of the past five years of publications issued by the Department are summarized in the following statement, giving the total number of copies of publications sold and the total receipts from such sales. The number of copies shown in the table does not in any case include distribution of publications to regular subscribers.

| Fiscal year. | Copies. | Receipts. |
|--------------|----------------------|--------------------------|
| 1910..... | 7, 114 | \$1,486. 05 |
| 1911..... | 9, 395 | ^a 14, 988. 95 |
| 1912..... | ^b 30, 775 | ^c 8, 712. 94 |
| 1913..... | 11, 248 | ^d 6, 271. 75 |
| 1914..... | ^e 43, 226 | ^f 13, 793. 35 |

^a Includes \$27.10 received for subscriptions and \$13.355 from sales of the 1911 World Trade Directory.

^b Includes 17,150 copies of 2 publications sold at a nominal price for redistribution.

^c Includes \$2,749.75 received for subscriptions and \$2,450 from sales of the 1911 World Trade Directory.

^d Includes \$1,958.55 received for subscriptions and \$1,090 from sales of the 1911 World Trade Directory.

^e About 13,000 of this number represents a distribution, at a nominal sales price, of economic circulars of the Bureau of Fisheries.

^f Includes \$4,029.25 received for subscriptions.

Work of the Solicitor's Office.

During the fiscal year ended June 30, 1914, 138 contracts totaling \$828,890, together with 8 contracts of indeterminate amount, 28 leases amounting to \$274,614, 13 revocable licenses

amounting to \$978, insurance policies in the sum of \$164,400, deeds involving payments of \$3,986, and 169 bonds amounting to \$436,539 were examined (approved, disapproved, drafted, redrafted, modified).

The number of legal opinions rendered, formal and informal (memorandum), totaled 287.

In addition to this, 490 miscellaneous matters, embracing everything submitted for the advice or suggestion of the Solicitor, or for the formulation of departmental action, not included in the foregoing items, were handled by this office.

BUREAU OF FOREIGN AND DOMESTIC COMMERCE.

This important Bureau, which is the spearhead of the Department's active commercial work, is for the first time in the possession of an organization adequate for its purposes. It works abroad through a threefold force, viz, the commercial attachés, the Consular Service, and the commercial agents.

Commercial Attachés.

The requirement for commercial attachés was fully explained in my report for the fiscal year ended June 30, 1913 (pp. 60-62). Congress having provided an appropriation of \$100,000 to establish this force, the subject was taken up soon after the close of the fiscal year with the Civil Service Commission, which cooperated in preparing blanks for the examination required by law and kindly arranged to have the written examination take place at its offices in 12 cities. A committee of officers from both the State Department and the Department of Commerce was formed to conduct an oral examination in the case of such applicants as passed the written one, and carefully revised ratings were made based upon the actual results of these examinations. It was arranged and announced that the experience of officers in the service of the Department of State and the Department of Commerce in actual commercial promotive work should be accepted in lieu of a portion of the examination, and it was provided by Executive order that consuls who might be promoted to the attaché service should not thereby lose their standing in the Consular Service. As a result of the examinations the following appointments have been made since the close of the fiscal year at the salaries stated:

- A. H. Baldwin, commercial attaché at London, England, \$5,000.
- Erwin W. Thompson, commercial attaché at Berlin, Germany, \$5,000.
- C. W. A. Veditz, commercial attaché at Paris, France, \$5,000.
- Henry D. Baker, commercial attaché at Petrograd, Russia, \$5,000.
- Albert Hale, commercial attaché at Buenos Aires, Argentina, \$4,500.
- Julean H. Arnold, commercial attaché at Peking, China, \$4,500.
- Lincoln Hutchinson, commercial attaché at Rio de Janeiro, Brazil, \$4,500.
- A. I. Harrington, commercial attaché at Lima, Peru, \$4,000.
- V. L. Havens, commercial attaché at Santiago, Chile, \$4,000.

All of the above appointees successfully passed both the written and oral examinations, save those who were promoted from the Government service after a careful review of their experience in

the kind of work the attaché will be required to do. Appointments of this kind were made in the case of Mr. Baldwin at London, Mr. Arnold at Peking, and Mr. Baker at Petrograd.

It is expected that all of these attachés will be at their posts by the time this report is printed. It is probable that the attachés at Berlin and Paris will be temporarily engaged in important work, collateral to their regular duties, in countries adjoining those to which they are assigned pending a further determination of the existing conditions in central Europe.

The cooperation of the Consular Service in our commercial work is a striking example of how broad-spirited cooperation between two departments can foster the public good. Too much can not be said in praise of the considerate and helpful spirit shown by the Secretary of State and all his subordinates in helping forward through an assistance both generous and skillful the important work this Bureau is called upon to do. The work of the Consular Service was never so well done as to-day, and it constantly improves. It is the effort of this Department to supplement the intelligent activity of our consuls with an equally intelligent use of the mass of valuable material which their labors place at our disposal.

The commercial agent is the traveling man of the Department. He takes a single subject or a group of subjects and goes from country to country in his study of them, submitting reports upon the one general theme from the point of view of many nations and of diverse markets.

The force thus briefly described may also be characterized—

The permanent officer with the general outlook—the attaché.

The permanent officer with the local outlook—the consul.

The traveling officer with a single subject—the commercial agent.

It is not meant in any way to exclude from kindly thought the important work of the consuls general. Rather, it is the spirit of this Department to cooperate with them in hearty appreciation of the important services they render. Our force in the foreign field is instructed that they are not rivals of our other national officers there, but helpers to them; that they are all engaged in the one common work of pushing American commerce, and that only the spirit of broad helpfulness by each to the other and by all for the common good will be tolerated.

Commercial Agents.

In the month of October, 1914, there were in service, or about to start to their respective fields, the following commercial agents:

H. N. Douthitt, electrical and general machinery supplies, South America.
Charles Ferguson, commercial investigations in the United States.
William A. Reid, special services in developing export trade, United States.
F. H. Smith, markets for lumber in the Orient.
S. S. Brill, markets for hardware in South America.
L. L. Bucklew, furniture trade in South America.
Garrard Harris, general commercial studies in Latin-American countries.
Benjamin Joachim, clothing trade in Latin-American countries.
Roger E. Simmons, lumber industry in South America.
Ralph M. Odell, cotton textiles investigation in the Orient.
J. A. Massel, general machinery, including machine tools, in South America.
L. B. Hoyt, general trade conditions in Mexico.

There is pending the appointment of another commercial agent to inquire into markets abroad for American fruits and still another to inquire into markets for general merchandise in Central America, Venezuela, and Colombia.

During the fiscal year commercial agents were engaged on investigations as follows:

E. N. Hurley, banking and credits in South America.
J. Alexis Shriver, canned goods in foreign countries.
Frank G. Bolles, coke-oven by-products and electric furnaces.
A. J. Wolfe, commercial laws in foreign countries.
W. A. Graham Clark, cotton textiles in Japan and Manchuria.
Ralph M. Odell, cotton textile trade and industry in China, India, and Australasia.
Henry D. Baker, commercial conditions in India.
E. W. Thompson, oil-seed products investigation.
E. A. Thayer, proprietary medicines, drugs, and canned goods.
D. C. Alexander, machinery trade in the Far East.
F. J. Sheridan, Grosvenor M. Jones, C. D. Snow, and C. W. A. Veditz, pottery investigation (cost of production).

Since the close of the fiscal year Dr. Edward Ewing Pratt has been appointed Chief of the Bureau and Mr. E. A. Brand and Dr. Frank R. Rutter have been appointed Assistant Chiefs.

Branch Offices.

The provision by Congress of a special fund for promoting commerce in Latin America, in addition to the general fund for promoting commerce, has not only permitted the selection of an active staff of trained students of commerce and industry but has also permitted another marked forward step in the organization of the Bureau for efficient work. It is all very well to have a good force in the foreign field, but if proper means do not exist to put the work of this force into touch with American commerce and industry the effort is largely wasted. Washington is not a commercial and industrial city, and it is difficult by mail or by publication to reach as intimately and effectively as is necessary the

industrial and commercial pulse of the country. Therefore, during the fiscal year, in an experimental way, an office was opened in New York to see whether a closer touch could thus be had with the business world and whether the new service would be used and appreciated. The success of that office led to the opening of others in Chicago, San Francisco, and New Orleans, and shortly after these there followed additional offices in Boston, Atlanta, and Seattle. An eighth office has only recently been established in the city of St. Louis, and other large cities are applicants.

This movement has been embarrassingly successful, for the appreciation of the mercantile world of this outward movement into their midst has been such as not only to lead to the calling for other offices beyond our power to supply them but to impose upon those offices which exist a burden of helpful work which they desire indeed to do but for which their means are quite inadequate.

To these offices are sent the consuls who come from abroad. The commercial attachés go thither before leaving for their posts or upon their return. The commercial agents make them their headquarters for bringing their work into touch with the local business community. Instead, therefore, of one center in Washington, from which substantially all contact with the business world was had by mail, there are now nine offices, including the central one, in eight of which contact with the business community is had personally and hourly.

By this means the Consular Service is made a live factor to business men, and both the consul and the merchant are the gainers thereby. The commercial agent on returning from abroad with a mass of accumulated information does not deposit it in a bureau to be hidden with other accumulations of like knowledge, but takes it out to the men who need it in the centers in which they conduct their affairs.

One further step is taken as this report goes to press. A traveling representative of the Bureau is put in the domestic field who will go from city to city conferring with merchants and manufacturers, informing them of the work of the Bureau, learning from them how its services to American commerce can be improved, instructing them how to avail themselves of it, and thus representing directly and personally the Bureau in its effort to extend our commercial prosperity.

To the above must be added the numerous publications and special communications which the Bureau sends out, a work which

is of a very diverse and extensive character and which is rapidly extending.

The services thus rendered to commerce are of a directly practical nature. Were this doubted, it would be easy to show to the skeptical records of actual orders obtained through the Bureau's action in making foreign conditions known to the domestic producer.

Under the new organization, completed but not yet fully in service, the Bureau anticipates a large development of its work for fostering our trade.

In Washington the facilities for digesting and distributing commercial information of every class are fully organized, practical methods are used, and excellent index systems, classified lists of business firms, numerous forms of publicity, a trained corps of editors, translators, statistical clerks, and tariff experts, are combined to render effective the useful trade facts collected for the commercial public.

For the details of the work of this office, reference is made to the annual report of the Chief of the Bureau. Practically all its branches show a development during the year. Its publications have been more numerous and have been widely circulated. These bulletins are now sold, free distribution being limited to those agencies (such as chambers of commerce and other commercial organizations, libraries, and trade papers) which materially further the publicity desired for trade information.

The statistical service has been much modified, with the purpose of emphasizing the promotive value of the important records of import and export commerce. The record of existing foreign tariffs has been currently maintained. The commercial agents of the Bureau have not only made many very practical reports of markets for cotton textiles, canned goods, drugs and proprietary medicines, by-products of coke ovens, banking and credits in South America, etc., but they have visited trade centers throughout the United States and by personal interviews and public addresses have much enhanced the effect of their work. It is regretted that a recent law hampers this most useful service by forbidding the attendance of Federal employees at trade conventions except at their own expense. It surely was not the intention that the law should prohibit the commercial representatives of the country from making known directly to business organizations the information which they have traveled far and labored hard to get, yet this is the effect of the restriction embodied in the law.

Cost of Production.

The important work which Congress assigned to the Bureau in collecting costs of production of articles subject to import duty has been actively carried on in two branches of industry. A survey of the earthenware pottery industry in the United States and Europe has just been completed, and most practical and valuable results have been obtained. Over 90 per cent of the American potteries were investigated, and no more complete study of an industry, it is believed, was ever made. A similar study of the great clothing industry is now in progress. The committees of Congress will find in such reports the essential facts in regard to an industry necessary to intelligent legislation on tariff matters. Such facts have heretofore usually been available not from a disinterested governmental source but from those whose interest might lie either in increasing or lowering tariff rates. The value of such detached and disinterested investigations of our industries is no longer in question, and this service is not alone useful in relation to tariff legislation but is undoubtedly of very marked promotive value to any industry that may be studied by competent agents.

Statistics.

Much constructive work still remains to be done, based on the broad foundation of plan and policy which has been established in the various branches of this service. The statistics of our commerce, for example, are now collected systematically by this Department only in regard to the trade that passes through our coast and border ports. This constitutes only 5 to 6 per cent of our commerce. The vast movements of trade within our boundaries are not recorded by this office. This is a serious defect in our system of collecting useful trade facts, and should be corrected. Provision should be made as soon as practicable for a suitable appropriation to establish the facilities for collecting and publishing these statistics of internal commerce. The branch offices of the Bureau furnish admirable organization units for beginning this work, and its value would be made clear at once to Congress and the public.

A general study of the methods of collecting, compiling, and publishing trade statistics is now in progress and will have an important bearing on the development of this branch of the promotive work of the Bureau. The Bureau has long been satisfied that the statistics of our import and export commerce, particularly of the latter, are inaccurate. They are collected under a

law passed in 1820, when much, if not most, of that which constitutes modern commerce had no existence and when our relation to the world was radically unlike its present one. It is believed that the statistics of our export trade are incorrect to an extent sufficient to alter at times a trade balance on mercantile transactions which is actually in our favor into one which appears to be the reverse.

The subject having been brought to the attention of the Secretary of the Treasury, he has kindly consented that an officer of this Bureau may be placed in the New York customhouse with a view to examining, and by cooperation correcting, the methods of collecting export statistics, so that the existing inaccuracies may be removed so far as it is possible to do so without legislation. With this in view, Dr. Frank R. Rutter, Assistant Chief of the Bureau, will be sent to the New York customhouse on this important service.

It is important that export associations and trade councils dealing with foreign business should exert their utmost influence to have our export statistics accurate. In a business as large as our export trade now is, an average error of 10 per cent in the valuation of our exports might well mean a difference of two hundred millions in the apparent value of the country's sales abroad, and such a sum might well turn and in certain years would have turned a balance seemingly against us on such transactions into one which really was in our favor. This would have a direct effect upon mercantile, industrial, and financial thought and action, now, it is to be feared, somewhat inaccurately informed upon this important subject.

For the coming year it is essential that the present useful activities of this office be vigorously maintained, and that such additional funds be provided as may be needed to care for the increase in the demands upon the Bureau, an increase which has been very marked during the past year and will no doubt continue.

The special fund for promoting commerce in Central and South America, of which 80 per cent is allotted to field investigations and the remainder used in Washington, should be continued and supplemented, as a permanent occupation of Latin-American markets is the only wise policy for our Government to support. The appropriation for commercial attachés should in time be increased to permit the dispatch of our trade representatives to the posts not now established which were recommended last year.

The branches of the Bureau in the United States have so completely justified their existence by useful and practical service to business firms that other cities should receive the aid now given in New York, Chicago, San Francisco, Seattle, New Orleans, Atlanta, Boston, and St. Louis.

The studies of costs of production in pottery manufacture and the clothing industry have also proven their worth, and should be carried into other industries. Fortunately, the work of this Bureau so clearly pays for itself in increased commerce and in aid to business that I feel that liberal support for its activities constitutes real economy in the expenditure of the Nation's funds.

BUREAU OF CORPORATIONS.

MERGER OF BUREAU IN FEDERAL TRADE COMMISSION.

According to an act of Congress of September 26, 1914, providing for a Federal Trade Commission, the Bureau of Corporations will be merged in the said commission immediately upon its organization. This act provides that the Bureau of Corporations shall then cease to exist, and that its employees shall become employees of the commission, and that the commission shall take over all the records, furniture, and equipment of the Bureau, and the conduct of all work and proceedings in which it shall then be engaged, while all appropriations made for the support and maintenance of the Bureau and its work are continued and authorized to be expended by the commission.

In consequence of the merger of the Bureau of Corporations in the Federal Trade Commission thus provided by law, and the fact that the direction of the present work of the Bureau will be intrusted to the commission, which is made independent of this Department, the usual statement with respect to policies and plans for the future have necessarily no place in this report.

The present report covers primarily the work of the Bureau of Corporations for the fiscal year ended June 30, 1914, but in view of the impending merger of the Bureau in the Federal Trade Commission, and of the fact that at the close of the next fiscal year the Bureau will no longer be within the jurisdiction of this Department, a statement is made also concerning the work of the Bureau subsequent to the said fiscal year, which brings the account of its activities practically down to the time of its severance from this Department, thus avoiding the necessity of referring to it in detail in subsequent annual reports of the Secretary of Commerce.

WORK OF THE YEAR.

The work of the Bureau of Corporations for the fiscal year was largely influenced by two circumstances. First, certain investigations commenced prior to the fiscal year, and in most cases during preceding administrations, were uncompleted and necessarily demanded first attention. Second, about the middle of

the fiscal year definite steps were taken by the legislative branch of the Government to establish a Federal Trade Commission and to merge the Bureau of Corporations therein, as stated above, and to enact supplementary antitrust legislation. This situation made it seem expedient for the Bureau to devote a considerable part of its attention to the study of economic and legal problems connected with the proposed legislation, and to the arrangement of its plans so as to be of greatest service to the proposed Trade Commission, if established.

Work Pending at the Beginning of the Year.

Several investigations commenced by the Bureau in prior years remained uncompleted at the beginning of the fiscal year covered by this report, namely, lumber, tobacco, agricultural implements, State corporation taxation, fertilizer, and petroleum. Work on all except the last two was initiated before the present administration.

Substantial progress was made in all of these investigations, and, except for State taxation of corporations and the last two investigations just mentioned, they were nearly completed during the fiscal year under consideration. A more definite statement of the matters reported on by the Bureau during the fiscal year is given below.

New Work Undertaken.

Apart from a general investigation of certain legal and economic problems relating to proposed legislation, referred to above, which included a study of foreign legislation on trusts, etc., certain new investigations were initiated by the Bureau during the fiscal year.

Among the most important of these was an investigation into the economic character and effects of the system of resale price maintenance, i. e., the practice of manufacturers and distributors of fixing the price at which retailers or other dealers in their products shall sell to consumers or other purchasers.

A study was also commenced of the conflict of State laws relating to foreign corporations. The wide divergences in the prerequisites for doing business in the various States have often seriously hampered and restricted the business world. A comparative study of this subject and the preparation and suggestion of a model system of regulation, it is thought, would tend to facilitate the establishment of a more uniform system which would be of great benefit to the business world and the public at large.

An investigation of the lumber and shingle industry in the State of Washington with regard to the general economic conditions was initiated and completed.

A similar but more elaborate investigation was initiated into the general economic conditions in the beet-sugar industry.

In accordance with a resolution passed on March 28, 1914, by the United States Senate, an investigation was commenced with respect to alleged discrimination in the prices paid for crude petroleum in the Healdton or Ardmore field of Oklahoma. This investigation was necessarily connected, to a large extent, with the one initiated just before the beginning of the fiscal year into the petroleum industry with respect to the prices paid for Oklahoma crude oil.

The Bureau also had in contemplation a comprehensive study of the fundamental problems of the efficiency of trusts; that is to say, of the determination of the question whether, from the standpoint of business profits, and also from other standpoints of social welfare, the trust form of organization was really, as is often alleged, socially and economically efficient. While some tentative work was done by the Bureau in this connection during the fiscal year, the lack of an adequate appropriation made it impracticable to organize a comprehensive investigation of this very large subject. Nevertheless, a fairly comprehensive survey of the industrial field has been made, which will furnish a basis for this work if the appropriation is provided therefor.

Work Completed.

With respect to the investigations commenced during previous administrations, practically all data necessary for the final reports were collected and digested before the end of the fiscal year, although the final reports thereon have not in all cases been completed at the present date.

During the fiscal year a special report on taxation was issued, supplementing previous reports on State taxation of corporations and covering the taxation movement throughout the United States during 1912. Subsequent to the close of the fiscal year, namely, on September 8, another report on taxation was issued covering the systems of corporate taxation in the Mountain and Pacific Coast States.

A report was issued during the fiscal year in connection with the lumber investigation regarding conditions of production, wholesale distribution, and prices of lumber. The results of the investigation into the shingle and lumber industry in the State of Wash-

ington were also reported on. Subsequent to the fiscal year further reports in connection with the lumber industry were issued relating to the concentration of the ownership of the timber resources of the country in particular localities and the concentration of land ownership among large timber owners.

The work of the Bureau has been so planned as to complete a large part of the investigations now on hand before its merger into the Federal Trade Commission by the publication of additional reports on tobacco, lumber, farm implements, taxation of corporations, petroleum (Healdton oil field), conflict of State foreign-corporation laws, and trust legislation.

The work of the Bureau during the fiscal year was by no means wholly confined to investigations which are the subject matter of the Bureau's reports. Not only was considerable assistance given to other branches of the Government service, through details of members of the Bureau's staff, but also extensive work was done of a statistical, economic, and legal character, with a view to aiding Congress, particularly in connection with tariff and trust legislation.

BUREAU OF STANDARDS.

Functions.

While the work of the Bureau of Standards covers a wide range of scientific work in physics, chemistry, and engineering, touching on the one hand the interests of the individual consumer and on the other those of the manufacturer, and enters directly into technical practice and into legislation, the work is primarily the development of standards. Standardization involves standards of measurement, standard values of technical constants, standards of quality, and standards of mechanical performance. Their complexity is due to the exacting demands of modern industrial and scientific work. The principle of standardization, which has become so powerful a factor in industry, has itself become the subject of searching analysis.

Standards of measurement are those in terms of which units of measure are defined. They underlie every indication of quantity or dimension, whether of matter, time, space, or energy. Upon such standards rests the availability of technical data for industrial application.

Standard values of constants are those measured data, determined with as high precision as possible, which serve to control industrial process. For example, every engineer must have handbooks giving the data which he uses daily in his work—designing structures, laying out industrial plants, and planning industrial processes. The effectiveness of the work of the engineer and of the industries which he serves is in direct proportion to the correctness of the data available. The determination of such standard data is an important function of the Bureau of Standards.

Standards of quality are quite modern in the scientific sense. Such a standard may be in the form of a sample of an ideal material, but are usually a description of the properties of an ideal material. In the latter form they are given as technical specifications. In proportion as these technical specifications are given in units of weight and measure describing the properties which insure the desired quality, the specification becomes a standard of quality. The establishment of such standards de-

mands the widest range of experience in the testing and use of materials and the most careful experimental investigation of the underlying scientific principles. This is an important function of the Bureau which is coming more and more to be appreciated.

Standards of mechanical performance are those that state the performance desired or guaranteed in terms of units of measure or in measurable terms of performance. In this respect this modern form of standard is perhaps the most complicated of all, since it involves standards of measurement, standard constants, and standards of quality. It is needless to say that only a beginning has been made in this field, but the work gives promise of the most fruitful results.

In a field so broad the Bureau can hope to touch only upon the more important aspects of such work—aspects which can not as efficiently be taken up in private laboratories.

Weights and Measures of Trade.

During the past year the Bureau of Standards has continued its work of stimulating nation-wide interest in honest weights and measures in daily trade. The need for a systematic inspection service for trade measures is obvious. The honest dealer is otherwise at a disadvantage, and the consumer is helpless, since the standards are in the custody of the Government. The Bureau helps in standardizing trade measures through the State and local inspectors, through manufacturers and their output of measuring appliances, and directly for the public upon request. The standardization is not limited to assuring the length of the yard, the weight of a pound, or the capacity of the gallon. The standardization service includes all factors affecting the correctness of measure of the products received by the consumer. The Bureau makes theoretical and experimental study of sources of error in measuring devices, suggests standard methods of measurement, methods of testing measures, standard tolerances, standard containers—all with a view to the best theoretical requirements.

The Bureau is continually rendering such service to all concerned. The Ninth Annual Conference on Weights and Measures at the Bureau last May was especially effective in bringing together the experience and problems of the weights and measures officials from 26 States, as well as of manufacturers and others interested in this subject. The discussions touched upon every phase of trade measures, and a manufacturers' exhibit supplemented the

program by affording opportunity to inspect new types of weighing and measuring apparatus.

In this and many other ways the Bureau has exerted a far-reaching effect upon the standard of fair dealing in commerce and trade. The Bureau is now an organized center where anyone interested in weights and measures may come for such assistance as the Bureau can render, and where anyone may be assured of a fair hearing in case of difficulty. Hence, manufacturers of measuring instruments come for suggestions to improve their product, sealers visit the Bureau to examine its equipment and methods of testing, the public by visits and correspondence submit questions involving fraudulent practices, State legislators and officials request the Bureau's judgment on the technical details of inspection service, and Congress calls upon the Bureau for its opinion on proposed weights and measures legislation.

Two bills affecting the weights and measures of trade are pending before Congress which would tend to improve conditions of such service. These aim to fix the standard barrel for fruit, etc., and to regulate the use of weights and measures. The bills are approved in principle and their enactment into law is desired.

The Bureau is cooperating with the Treasury and Agricultural Departments in the enforcement of the new law requiring the quantity label on package goods. The enactment of this law is one of the recent successes of the movement for honest weights and measures. The law gives the consumer a direct knowledge of the net quantity of product in a large proportion of his purchases. The Bureau experts assisted the board designated in the law, especially with reference to the technical details of measurement and specification of quantity.

Public Utilities.

During the year an appropriation was made by Congress to conduct work in connection with public utilities. With the rapid growth of public-utility regulation by State and municipal commissions, a great number of technical questions have arisen which involve standards of regulation and control. The success of public-utility regulation depends upon the carefulness with which it is based upon ascertained measures and standards.

An ideal regulation would involve standards for many details of the service and include the more complex subjects of quality, efficiency, distribution, process, and control. This is an extension

of the idea of units and standards of measurement of the simpler forms.

The work of practically all divisions of the Bureau has been at times called upon to meet the demands for information and advice on these subjects. Engineering investigations have been undertaken in connection with standards for illuminating gas and electric service, particularly in connection with the mitigation of electrolysis, and with the promotion of safety in electric practice. An interesting point in connection with the gas standards is that at different altitudes different specifications are required to secure the same heating value in a gas, since this depends upon its mass and composition rather than its volume merely.

The Bureau has been requested by State and city governments and public-service commissions to assist in research designed to secure more efficient regulation of particular utilities. It is gratifying that the National Government has available the laboratory facilities for submitting to rigid laboratory experiment the various technical questions connected with this subject.

The Bureau during the year has continued its advanced work and field investigation of the methods of electrolysis mitigation. Its laboratory investigations include the effects of electric current in underground pipes, tests of pipe covering, corrosion of metals in soils, and many other experimental phases. An electrolysis survey was made at Springfield, Mass., as a demonstration of what could be done in securing relief from electrolytic corrosion. The results thus far obtained have been very gratifying.

In connection with electric light and power service, the principal factors to be prescribed are quality and reliability, and the accuracy of meters that measure the current. These may be investigated by experiment and measurement, and the results will be of great value to the public, both the consumer and producer, by making the mutual understanding more definite, thus avoiding suspicion and inefficiency. The Bureau has issued recently a manual of safety rules in connection with life hazard involved in electric current distribution.

The Bureau serves in a cooperative and advisory capacity as to standards involved. In special cases the Bureau experts are asked to visit and study local conditions. The extent to which the regulation of public utilities involve laboratory work, field measurements, and standards is striking. Clear specifications for an efficient service refer in almost every paragraph to units of measure, measuring instruments, or standards. In gas service, for example,

the vital factors—quantity, candlepower, pressure, and quality—all are measurable and may be specified in units of measure. Standards may be set for each element so selected as to assure a uniformly efficient service. Each of the units has measured elements. For example, the measurement of candlepower involves the plan of testing, the unit of candlepower, the effect of atmospheric conditions, the bases of rating, humidity corrections, and correctness for air pressure. All these are measured details affecting the measurement of candlepower.

In the public-utilities work the Bureau has secured the ready cooperation of engineers, inspectors, and local government officials. The Bureau thus has available and is accumulating data and experience. It is enabled to tabulate and study such data and draft model regulations which have passed the critical scrutiny of the Bureau and the best experts in the country. This enables the utilities commissions to begin upon a technically correct basis. The Bureau aims to be in the highest degree helpful to the public, the public-utilities companies themselves, and the public-service commissions which regulate them.

Manufacturers, etc.

Practically every industry has its units, its special methods of measurement and measuring instruments designed for every kind of need. The Bureau aims to critically study the theory of such instruments with a view to pointing out sources of error. It also certifies the corrections to standards by which such instruments are constructed. It is equally necessary for the Bureau to examine the methods by which such measuring instruments are used; and by aiding the manufacturer to secure accurate measuring instruments, and to apply the most precise methods of measurement, the Bureau is aiding industry at fundamental points. Modern industry is effective in proportion as precision methods of measurement are applied to the details of industrial process.

The report of the Bureau for the year shows clearly the intimate connection between standardization and the industries. The engineering professions have appealed to the Bureau to investigate the adequacy of the formulas upon which the strength of columns are computed. At the request of the refrigeration engineers, the Bureau has begun the redetermination of the certain constants upon which their calculations are based; likewise, the fire-prevention interests have united in requesting that the Bureau

standardize the procedure for determining the fire-resisting properties of materials and the value of devices to be used in fire prevention. These are examples of the requests, continually being received from those concerned, to assist the industries in standardizing methods of measurement and testing, and in making researches involving precision measurements. The demand for higher precision is felt keenly at points where the economies and efficiencies to be secured are especially notable, such as the accurate knowledge of temperatures in metallurgy, ceramics, and similar industries; the location of stray currents from electric mains and their neutralization; the establishment of more precise color standards for use in specifying and reproducing definite colors in inks, dyes, and other products—these and many others emphasize the highly practical nature of precision measurements, a fact too often overlooked.

For the cement industry the Bureau's work in standardizing the testing methods has resulted in improved quality of the sieves submitted for test.

For the watchmaking industry the testing of the higher grade watches was begun, and the Bureau is prepared to undertake such tests regularly four times each year. The procedure and regulations were discussed in a conference of watch manufacturers held at the Bureau during the year.

Precise determinations of the density of commercial materials, such as oils, turpentine, milk, and cream, have been made.

The changes of dimension upon heating must be carefully considered by manufacturers. For this purpose the Bureau is studying the expansion of metals. One research gives promise of correlating the changes of length with corresponding changes in electrical resistance.

The standardization of aneroid and mercury barometers has been pushed vigorously during the past year. The importance of such instruments, particularly aneroids, is caused by their increased use in aviation and exploration. In some cases the ratings of aeroplanes depend upon the readings of aneroids.

The Bureau has done excellent work in standardizing the various heat-measuring instruments used in determining the heating value of fuels. The recent progress in the industrial handling of fuels has been in the direction of specifying the fuel value. To determine this heating value, instruments and methods must be accurate. After extended investigation the newer methods and instruments have been found capable of high precision.

In order to fix the temperature scale for very high temperatures, precise determinations of melting points are of importance. The Bureau completed an investigation of the melting points of the iron group, including the melting points of those metals used as alloys with iron in steel making. The publication of these results will aid metallurgists in temperature ranges where existing data is of uncertain precision.

The Bureau has determined the melting points of fire brick and materials used in connection with the high heats required in industrial processes. The aim of this work is to assist in developing the most refractory materials suitable for such work.

For the refrigeration industry numerous constants must be obtained. Among them the latent heat of fusion of ice has already been determined by the Bureau. Numerous other laboratory investigations are under way, which together are intended to place the most accurate values of the fundamental data required in refrigerating engineering in the hands of that profession.

Pure materials having definite heating values are issued by the Bureau at cost of production. These enable the user to check the value of his work and to standardize his instruments.

Ten separate lines of investigation in refrigeration were undertaken. Much of the apparatus had to be designed, as the work was in new fields. The experimental results will follow with reasonable rapidity but will require at least two years more. The Bureau has kept closely in touch with the needs of the refrigeration industries and with the National Association of Refrigeration Engineers.

In connection with the industries requiring high temperatures where ordinary thermometers can not be used optical methods must be adopted. The Bureau has made an investigation of the various types of so-called radiation pyrometers in order to standardize the methods of using these instruments. This will tend to greater accuracy and consequent increased efficiency in the industries concerned.

An interesting economic change in the gas industry is the present transition from the lighting value to the heating value as a specification of quality. After extended laboratory and field investigations, the Bureau has prepared a series of publications covering the field of gas calorimetry and standard methods of gas testing. The Bureau researches aim to assist the gas industries in standardizing their product and their methods of

testing for quality and quantity. The results of this work are of equal value to the public-service commissions, to which is intrusted the regulation of the relations between producer and consumer. Model gas regulations revised from time to time are published by the Bureau as a basis for commission regulation of this important public utility.

Educational Institutions.

The Bureau publishes three series of publications covering the entire field of the Bureau's work. It also distributes graphic charts of the two systems of measurement used in this country and special pamphlets giving a history of the standards and a description of the metric system. Many of the circulars dealing with methods of testing have been used as the basis of courses of study in certain educational institutions.

In accordance with the law governing the Bureau's work, the Bureau is permitted to standardize scientific instruments for State universities free of charge, and this work has grown. This service is highly appreciated, in view of the fact that much of the value of scientific investigation conducted at universities depends upon the use of accurate measuring instruments. The Bureau also assists State universities by the distribution of standard analyzed samples to be used as auxiliary material in teaching quantitative analysis in courses in technologic chemistry. Conferences of physicists, including instructors from the various universities, are held annually, and in connection with the last meeting an exhibit of scientific measuring instruments and other apparatus was held which proved of great interest and value to all concerned.

The Bureau cooperates with educational institutions in conducting investigations by its readiness to give data and occasionally to furnish materials if such are not obtainable elsewhere, and also in some instances to loans facilities.

Work for State Governments.

The Bureau assists the State legislatures when called upon in connection with the technical details of legislation affecting measurements. These include the units, standards, measuring instruments, and methods of measurement of the various public utilities such as electric light and power service, gas, water, and similar utilities, as well as all questions affecting the inspection of trade weights and measures. In many cases the means to secure such

technical data are not available except at the Bureau. The various interests concerned, including the public-service corporations themselves, have requested the Bureau's cooperation in connection with the standardization of these utilities. The Bureau is an unbiased institution, ready to serve all concerned, and in general its work is done and its decisions reached only after the fullest consultation with all interested and after consideration of all sides of the subject. In other words, the Bureau aims to take up mainly such questions as may be settled by laboratory experiment or by direct measurement.

The Bureau of Standards has tested the standard weights of 16 States, which is an indication of the growth of interest in public inspection in the States.

The Bureau undertook to organize an inspection department of weights and measures for the island of Porto Rico, and this was completed during the year with signal success. This service was undertaken at the request of the War Department. The value of establishing at the outset a model system of inspection can hardly be overestimated.

The conference of State officials, referred to above, held at the Bureau of Standards to discuss the State administration of weights and measures inspection was the most successful in the history of these conferences. The wisdom of these conferences is shown by their mutual value in acquainting the Bureau with local conditions and familiarizing the new State officials with the standardization and testing work of the Bureau of Standards.

Precision Standards.

The need for standards of length, mass, capacity, heat, light, and electricity is now generally appreciated. Continual care and laborious experimental work is often needed to maintain many of these standards. In many cases the cooperation of many countries was needed—for example, in the case of the standards of length and mass. In others, the standards are kept at constant temperatures, such as the standards of electromotive force, or under fixed conditions of moisture, humidity, or pressure. In all cases, whenever possible, the Bureau aims to steadily improve the precision standards or the methods of maintaining or using them.

In quite a different order of activity, new kinds of standards are being developed; for example, standards of quality and standards of performance. These standards are still in the initial stages, but will eventually become of supreme importance in

furthering industrial advance. The keen interest in recent years in standard specifications is an index of what must eventually extend to every material, device, machine, or process in industry.

The standards of quality for materials must be fixed, so that the best quality suitable for each use may be clearly specified. The standards of performance of devices and machines must be so fixed that by them the efficiency may be judged. In recent years energy has become a commercial product and is distributed in various forms. Electric energy, for example, may be delivered under various pressures, and may be direct or alternating current, and in the latter case may vary in frequency. The importance, therefore, of clearly specifying the form in which energy shall be delivered makes it a technical matter involving accurate measurements. Specifications for electric current covering both quality and quantity may often be made even more exact than for materials.

It has been the aim of the Bureau to keep pace with the technical needs for the more advanced forms of standards. Evidence is not wanting that industry has entered upon the stage where such advanced standards are indispensable.

New Standards.

The high economic and scientific value of radium lead the Bureau to acquire suitable "radium standards" for measuring the radium content of samples intended for sale or technical uses. During the year many samples of radium materials have been certified for the public by comparison with the sealed radium standards of the Bureau.

A new kind of standard was established at the Bureau during the year, namely, a standard of radiation. The new standards of radiation are incandescent lamps, the intensity of radiation of which was measured in terms of the simple units of measure by which energy is defined. The standards met with instant demand from investigators here and abroad in the field of radiation research.

It is of interest to note that the Bureau distributed at cost nearly 300 standards for heats of combustion—naphthalene, benzoic acid, and cane sugar—each of highest purity and definite heating value, certified by the Bureau. The instruments and methods used in testing the heating value of fuels may be readily standardized by these standard materials. They bear the same relation to fuel testing that standards of length bear to surveying.

Standards of melting points are being planned to aid metallurgists and others in standardizing the readings of their high-temperature measuring standards. Other optical standard materials include pure sugar for finding the 100° point in saccharimetry, rare gases for obtaining light of specific wave lengths, material of certified and defined color for use in butter and oil standardization.

The 100° point in saccharimetry is the scale reading for perfectly pure sugar. It is analogous to the length of the day as fixing the unit of time—the second. The universally accepted value of the 100° point was found by the Bureau to be in error by about 1 part in 1,000. The Bureau's precision determination of this point, now completed, is a distinct contribution to sugar testing and polarimetry.

The Bureau is measuring certain wave lengths of light with the highest possible precision for use as standards. The use of known wave lengths of light is just entering technical work, but their value in the study of the stars and of the sun can scarcely be overestimated. Upon them are based the measurements of stellar motion in the line of sight. In the study of the sun the same principles are applied in an even more remarkable manner. It may almost be said that a knowledge of the wave lengths of light has revolutionized astronomical and solar research. The extent of possible applications of precision measurements with light waves is almost unlimited. The work of the Bureau in this field is to cover as fully as possible the fundamental determinations of standard waves of monochromatic light, so that the results may be available for direct application in scientific and technical work.

Standards of color depend upon an accurate knowledge of the intensity and wave length of the component colors. One method of specifying color defined a standard in terms of the wave length of the dominant hue and the percentage of white light present. Spectroscopy bears somewhat the same relation to light that chemical analysis bears to materials. Spectrometry includes the determination of colors (wave lengths) present in any light, and the intensity of each. The instrumental equipment required in establishing color standards must therefore be accurate and based upon theoretically sound optical principles. Color standards have important and widespread applications in the industries making or using dyes, inks, paints, illuminants, textiles, paper, and clay products, and in many branches of science as well.

Government Testing Bureau.

The various branches of the Government have increasingly availed themselves of the facilities offered by the Bureau for testing, until during the past year about 90 per cent of the Bureau's testing was for the Government departments. The Bureau has thus become, in fact, the testing laboratory of the Government, having performed about 100,000 tests during the year for the Government departments. It aims to serve the scientific and other bureaus as to questions affecting units, standards, measuring instruments, and methods of testing of materials, devices, and apparatus, for which work the Bureau is specially fitted by equipment, facilities, and personnel to render expert assistance. This work is carried on in such a manner that the experience gained may be utilized in drafting improved specifications; that is, in developing true standards of quality, designed to place Government purchases on a scientific basis as regards quality.

The Bureau has tested a large number of sets of test weights for the Post Office Department to be used by their inspectors in verifying the scales in use in that Department, and has inspected the scales manufactured for the Postal Service to ascertain whether they are satisfactory for their intended use.

The importance of chemical tests and their correlation with service behavior has increasingly engaged the attention of the Bureau experts. The Bureau has conducted approximately 10,000 chemical tests of materials, for practically all the Government departments. By supplementing the chemical analysis with physical tests, it is frequently found possible to select the materials which would best meet service conditions, and to specify such material in units of measurement.

The Bureau has made special studies of the paper, ink, and binding cloth used in Government documents, and the same are now purchased under specifications and submitted for test. During the year the Bureau published methods of analysis of printing inks which have been found adequate.

Both the manufacturer and the Government gain by more definite specification of the properties of the materials desired. It is the growing belief that this is possible to an extent little realized at present. The minute specifications of performance of instruments are examples of a method of securing efficient equipment which will doubtless be applied in the future to materials and services of all kinds.

The useful character of the service being rendered by the Bureau in testing structural materials (nearly 9,000 tests during the year) is evident when it is remembered that by this systematic testing of materials before use the durability of Government construction work, and its efficiency and safety, are guaranteed as fully as the state of the arts allow. The many rejections of unfit material are a partial index of the defective construction that would have been possible without such testing. This work leads directly to the adoption of standard specifications for materials for all purposes, a result which will be of benefit not only to the industries concerned but to the entire public.

Information.

A most important service which the Bureau renders is in furnishing to the public, to the various industries, and to the Government bureaus technical information on subjects within the Bureau's field. During the year thousands of letters were received requesting information of the most varied character as to standards and methods of measurement.

The requests come from a wide range of sources—Government offices (city, State, and national), public-service corporations and commissions, industrial laboratories and plants, commercial houses engaged in foreign trade, consulting engineers, educational institutions, and the general public. The replies range from a brief answer to a carefully prepared report, depending upon the importance of the question involved and the service to be rendered.

In many cases the inquiries emphasize the need of information and are followed by new publications prepared on the subjects within the Bureau's field, but upon which the data are either unavailable elsewhere or widely scattered in technical literature. The inquiries thus serve partially to guide the Bureau in selecting topics for circulars based upon the relative urgency of the subjects pressing for publication. These printed circulars then become standard replies to many hundreds of the letters received annually.

In many cases the adoption of methods in the industries depends upon the Bureau's reply. The Bureau is often enabled to suggest means of securing improved economy and efficiency in industrial processes. In other cases the Bureau prevents costly experiments, and minimizes the chance of failure, especially where standards or measures are involved. The latest methods of measurement and other data are usually known or available to

the Bureau, which thus serves as a clearing house for technical information as to materials, units, standards, instruments, and methods of measurement. An unique aspect of this work is that without police power to enforce its decisions the Bureau exerts so widespread an influence, by virtue of its unbiased attitude and its carefulness in arriving at accurate results. The success with which the Bureau is making its results available to the public through correspondence, consultation, and publication is recognized by the national technical societies through which so largely the work of the Bureau enters current technical practice.

Materials and devices are often advertised and sent through the mails which are properly subject to a fraud order. Extravagant claims induce investment by those with limited means. The Bureau has rendered frequent service in showing the fraudulent character of such inventions. Inventors apply to the Bureau for the testing of proposed inventions which are utterly unscientific. In many cases vast sums have been wasted on impossible schemes. The Bureau tries to convince such inventors of the hopelessness of their attempt. In such cases the Bureau measures the effect claimed and places the facts before the inventor. On the other hand, the Bureau is constantly assisting intelligent inventors, where its advice is sought, on matters lying within its field.

The Bureau's Influence in Establishing Scientific Research and Methods in the Industries.

Another important function of the Bureau is the stimulus which it has continually given to the establishment of industrial-research laboratories. Since the establishment of the Bureau this has become a distinct industrial movement in this country. Many large corporations now have well-equipped laboratories for scientific research. These utilize the work of the Bureau and have increased the applications of science to industry to a notable extent. The Bureau has shown the need for technical research by calling attention to unsettled problems, by pointing out the values of specific researches, and by actual instances of service rendered, so that it is not surprising that its influence in this respect has been widespread.

Buildings.

Attention is again called to the necessity of properly housing the structural materials work, especially the branch of the work at Pittsburgh, and which is temporarily located in buildings of the

War Department at the arsenal grounds. These buildings are entirely unsuited for the purpose either as to location or character, and the Bureau has considered it unwise to expend any funds on their preparation as laboratories other than the barest necessities. Furthermore, the War Department has repeatedly asked for the vacation of the building.

Every effort is being made by the Bureau to place its structural work on a basis commensurate with its importance. Considerable heavy equipment has been accumulated both at Pittsburgh and Washington, and more will be needed. Good work is being carried on at both places, but the large testing machines, furnaces, and other heavy equipment should be brought together in a building designed for the purpose and sufficiently large to accommodate all heavy equipment of this kind. It is uneconomical and inadvisable to proceed with the installation of permanent heavy equipment in temporary quarters.

Additional Ground.

The recent opening of Van Ness Street north of the Bureau at a place not adjoining the Bureau's grounds makes it necessary to secure the small strip of land between that street and the north boundary of the Bureau's site. Efforts were made without avail to secure the location of the street in a position adjoining the Bureau's property. It is also advisable to secure the narrow strip between the Bureau and Tilden Street on the south.

Investigation of Clay Products.

The pottery, brick, tile, terra cotta, and other industries engaged in the production of clay products are greatly in need of reliable and authoritative data concerning the properties of these products and the materials which enter into them. In few industries is there any greater opportunity of the improvement by the application of precise measurements and of scientific knowledge of the nature of the products. An item has been included in the annual estimates to provide for this work.

Transverse Testing Machine.

Attention is again called to the necessity of adding to the Bureau's equipment a large transverse testing machine capable of testing the transverse strength of full-sized steel girders used in bridges and buildings; also brick, stone, and concrete arches, floor constructions, etc. The late Alfred Noble, one of the most promi-

nent engineers that America has produced, made the following statement concerning the necessity for the construction of such a machine:

The use of steel and concrete in girders in the construction of bridges and buildings is increasing rapidly. The calculations of strength of such girders are to a large extent based on theory, not well checked by actual tests; such tests as have been made were on small girders, and the value of the results in determining the dimensions of large girders such as are now in common use is doubtful. It is questionable whether, on the one hand, many structures in daily use are not perilously near the breaking point; or, on the other hand, whether the structures are not built unnecessarily massive and costly.

There is therefore great need of a large testing machine for actually testing the strength of girders of large size. Such a machine, operated under the direction of the Bureau of Standards, would soon repay its cost by inducing more economical and safer construction.

Since transmitting the original estimate for this machine much additional evidence has been secured, all indicating the great need on the part of engineers for data that can only be obtained by a large machine of this character. A sum sufficient to enable the Bureau of Standards to begin its design and construction has again been included in the estimates.

BUREAU OF THE CENSUS.

During the fiscal year the Census Bureau brought to completion the deferred work of the Thirteenth Decennial Census; began various special compilations of Thirteenth Census statistics; commenced and brought well toward completion the preparation of a "statistical atlas" based on data collected at the Thirteenth Census; tabulated and published data relating to the dependent, defective, and delinquent classes; conducted the decennial inquiry on wealth, debt, and taxation; completed its quinquennial canvass of electrical industries and a considerable part of the work of compiling the statistics obtained; began preparations for its quinquennial census of manufactures, the field work for which will begin early in the calendar year 1915; compiled and published the biennial Official Register of the United States; carried on its regular annual investigations covering vital statistics, statistics of cities, and cotton production, distribution, and consumption; completed the annual forest-products inquiry relating to the calendar year 1912; made its semiannual collections and publications of statistics of stocks of leaf tobacco held by manufacturers and dealers; and answered numerous mail requests for information contained in its records.

COMPLETED WORK.

Deferred Thirteenth Census Work.

During the fiscal year Volumes I, II, III, V, VIII, X, and XI of the final reports of the Thirteenth Census were issued, and Volume IV was ready for distribution on July 7, 1914.

The report on Mines and Quarries (Vol. XI) was issued December 30, 1913. Its scope, as originally planned, was considerably curtailed in order to avoid greater delay in publication.

The report on Occupations (Vol. IV), as already stated, was ready for distribution July 7, 1914, and four bulletins relating to occupations were issued in July and August, 1914.

In addition to the reports mentioned above, there were issued during the fiscal year three editions of the Abstract, with supplements for Alaska, Hawaii, and Porto Rico, respectively; 16 reprints,

in bulletin form, of chapters in Volume I (Population—General Report and Analysis); 12 reprints, in bulletin form, of chapters in Volume V (Agriculture—General Report and Analysis); 1 reprint, in bulletin form, of a chapter and table in Volume VIII (Manufactures—General Report and Analysis); 40 bulletins on manufacturing industries, which later formed sections of Volume X (Manufactures—Reports for Principal Industries); 1 bulletin relating to manufactures in metropolitan districts, which later formed a section of Volume X; 1 bulletin relating to iron mines, which later formed a section of Volume XI (Mines and Quarries); and 1 special bulletin relating to the stability of the agricultural population.

Forest Products.

The annual collection of statistics of forest products was inaugurated in 1906, in accordance with an order of the Secretary of Commerce and Labor, on the initiative of the Forest Service of the Department of Agriculture. The inquiry, although never authorized by Congress, was continued by the Bureau of the Census, in cooperation with the Forest Service, from 1906 until 1912, when it was abandoned by the Census Bureau upon the recommendation of the expert special agents (former officials of the Census Bureau) who were appointed by the Director early in the fiscal year to devise plans for expediting the delayed work of the Bureau and to make recommendations for such changes as seemed desirable. The recommendation made by these expert special agents with reference to the forest-products inquiry was as follows:

That the annual compilation of the statistics of forest products be abandoned. There appears to be no authority of law for an annual inquiry of this character, which the records show to have cost from \$20,000 to \$40,000 a year.

In view of the importance of these statistics and of the demand for them from large consumers of forest products and others interested in the conservation of natural resources, the Forest Service undertook the task of collecting the figures for 1913. It has been decided that the Census Bureau collect the figures for 1914 in connection with its regular quinquennial census of manufactures, which will cover that year; and an effort will be made to secure the passage of an act or resolution of Congress authorizing the Bureau, in cooperation with the Forest Service, to continue the annual collection of these statistics.

The work done during the fiscal year included the completion of the canvass covering the calendar year 1912, the com-

pilation of the results, and the preparation of the report, an octavo pamphlet of 60 pages, which was issued February 7, 1914.

Official Register of the United States.

This publication, a quarto volume of 876 pages, was compiled during the first half of the fiscal year, and was ready for distribution January 7, 1914. As a result of suggestions made by the Department of Commerce, the urgent deficiency act approved October 22, 1913, provided for the discontinuance of the publication of Volume II of the Official Register, relating to the Postal Service. The act also provided for the omission of the list of ships and vessels belonging to the United States, formerly included in Volume I. This legislation greatly simplified the preparation of the Official Register and very materially decreased the expense of the work.

Legislation authorizing the adoption of the following plan with reference to the preparation and publication of the Official Register of the United States has been recommended to Congress:

(1) The establishment of a card directory, prepared and maintained by the Civil Service Commission from information furnished by the executive departments and independent offices, showing the name and status of every person in the Government service except the officers and enlisted men of the Army, Navy, Marine Corps, and Revenue-Cutter Service. Lists of officers of the Army, Navy, and Marine Corps are already published annually in the Army Register and Navy Register, issued by the War and Navy Departments, respectively.

(2) The elimination from the Official Register of detailed lists of all employees, by name.

(3) The publication annually by the Bureau of the Census of an Official Register containing: (a) A list of all employees of the Government (except officers and enlisted men in the Army, Navy, Marine Corps, and Revenue-Cutter Service) whose duties are of an executive, supervisory, technical, or professional character, and whose compensation is \$2,000 or more per annum; (b) statistics relating to the Government service, to be prepared from the Civil Service Commission's card directory.

This recommendation was mentioned in the annual report of the Secretary of Commerce for the fiscal year 1913, as coming from the Director of the Census, and was made by the Director in his annual report for that year. The proposed plan, if adopted, will result in very material saving to the Government, will at the same time

preserve all the valuable features of the present Official Register, and will provide for a complete and up-to-date record of the entire personnel of the Government in one central office (the Civil Service Commission), from which the Census Bureau will be able to prepare accurate statistical statements when called upon to do so by the President or by Congress.

A bill substantially embodying the foregoing plan (except that \$1,500 instead of \$2,000 was fixed as the lowest compensation of employees whose names should be included in the Official Register) was introduced in the House of Representatives on August 8, 1913, by Hon. W. C. Houston, of Tennessee.

CURRENT WORK.

Wealth, Debt, and Taxation.

This is one of the most important of the Bureau's "intercensal" inquiries. A portion of the data for the current series of bulletins, which relate to the fiscal year ended June 30, 1913, was obtained from printed reports of the Federal Government and of States, cities, and counties; the remainder was gathered by personal canvass. The office work on this investigation was commenced in October, 1913. The field work began March 21, 1914, and during the period from that date to June 30, 1914, the employees in the field numbered, on the average, 86.

Work is progressing rapidly and satisfactorily on this inquiry. Two bulletins—"National and State Indebtedness and Funds and Investments" and "Taxation and Revenue Systems of State and Local Governments"—have been issued since the close of the fiscal year 1914; another, "National and State Revenues and Expenditures, 1913 and 1903; and Public Properties of States, 1913," will come from the press in a short time; and four more—"County and Municipal Indebtedness, 1913, 1902, and 1890; and Sinking Fund Assets, 1913," "County Revenues, Expenditures, and Public Properties, 1913," "Municipal Revenues, Expenditures, and Public Properties, 1913," and "Assessed Valuation of Property and Amounts and Rates of Levy, 1860-1912"—will be issued late in 1914 or early in 1915. The final bulletin, "Abstract—Wealth, Debt, and Taxation," will contain an abstract of the statistics presented in the seven bulletins just named, together with an estimate of the true value of all property in the United States, both subject to and exempt from taxation. This final bulletin will be issued early in 1915—about a year and a half from the commencement of the office work and about a year

from the commencement of the field work. In this connection it may be stated that the field work on the last preceding inquiry on this subject was commenced March 1, 1903; that two bulletins, relating to municipalities, were issued August 31, 1905, and July 12, 1906, respectively; and that the complete report was ready for distribution May 7, 1907—more than four years from the beginning of the field work. No data are available from which to make anything like an exact comparison of the two investigations with respect to cost; but there has been a very material saving in this respect, approximately \$150,000, due in part to the fact that some 15 or 20 per cent of the statistics collected at the present inquiry were obtained from published reports of the various governmental units, the work being done in the office at Washington instead of by personal canvass in the field, and in part to the early completion of the investigation, which was finished before the close of the calendar year 1914.

Electrical Industries.

Statistics of electrical industries are collected quinquennially by the Census Bureau. The current inquiry relates to the calendar year 1912. The field work for this census was begun in January, 1913, and was completed in November of the same year. The field employees numbered, on the average, 27. Press summaries of the statistics were issued from time to time as the tabulation progressed, beginning in December, 1913, and two bulletins were issued in May and June, 1914, respectively, the first presenting the principal data in regard to telephones and telegraphs and the second giving the more important statistics relating to central electric light and power stations and street and electric railways. The final reports will be issued late in 1914 or early in 1915 in the form of two quarto volumes. One, entitled "Central Electric Light and Power Stations, and Street and Electric Railways," and comprising nearly 600 pages, will include in more detailed form the statistics contained in the bulletin under the same name. The other, entitled "Telephones and Telegraphs," and comprising about 250 pages, will contain in amplified form the data given in the bulletin on telephones and telegraphs, together with a section showing telephone rates throughout the United States. Statistics relating to municipal electric fire-alarm and police-patrol signaling systems will also be included. Comparative statistics will be given in each report, covering two five-year periods (1902-1907 and 1907-1912), thus bringing out definitely and clearly the enormous growth of electrical industries during the past decade.

Dependent, Defective, and Delinquent Classes.

Under this heading come the Bureau's decennial reports on benevolent institutions, paupers in almshouses, the insane and feeble-minded in institutions, prisoners and juvenile delinquents, and the blind and deaf. The report on benevolent institutions, a quarto volume of 411 pages, was published during the year, and three bulletins, relating, respectively, to insane and feeble-minded in institutions, to paupers in almshouses, and to prisoners and juvenile delinquents, have been issued, which will later be followed by the final reports on these classes. With respect to the insane, feeble-minded, and paupers, all the fundamental data are presented in the bulletins already issued; but the final reports, now nearly ready for publication, will present in addition a discussion and analysis of the statistics, including ratios, percentages, and diagrams, while the final report on prisoners and juvenile delinquents will also contain certain fundamental data not heretofore published. This volume will be ready early in 1915.

These reports will be more complete and comprehensive in scope than any which the Bureau has previously published on these subjects. The report on the insane in particular, which has been submitted in proof to well-known authorities on insanity, has been commended as representing a marked advance in the statistical treatment of that subject.

A summary of State laws relating to the care of the dependent classes has just been issued.

Statistical Atlas of the United States.

This publication was prepared during the fiscal year and will be issued this month. It will be a quarto volume containing 99 pages of text and 503 plates carrying maps and diagrams presenting graphically the more important facts brought out by the various decennial and other census inquiries. The current statistical atlas covers the subjects of population, agriculture, manufactures, mines and quarries, cotton production and consumption, financial statistics of cities, vital statistics, religious bodies, marriage and divorce, and insane in hospitals. The purpose of this volume is the presentation of the more significant statistics collected by the Census Bureau in such form that they may be readily grasped and understood.

Special Compilations of Thirteenth Census Statistics.

After the completion of the work of a decennial census the Bureau makes various special compilations of the statistics col-

lected at that census which it would not be feasible to include in the regular reports. Such compilations of Thirteenth Census material include a report on Indians; supplementary occupation statistics; bulletins on Chinese and Japanese in the United States, the stability of the agricultural population, and ages of farmers; and a report and bulletin on Negroes in the United States.

The Indian report, a bound volume of several hundred pages, will be issued next month. A 25-page bulletin relating to the Indian population was published in June, 1913.

Work is now under way on a special report presenting supplementary occupation statistics. This report will include the following subjects: Distribution of all persons occupied, by sex, according to color or race, nativity, and parentage, and age periods in detail; occupations of women; occupations of children; occupations of foreign-born workers according to country of birth; occupations according to class of worker; and unemployment data, for wage workers only.

The Bureau has just issued a 50-page bulletin in which are brought together all the statistics regarding Chinese and Japanese in the United States which are found in the Thirteenth Census reports on Population, Occupations, and Agriculture. There has been a great demand for this bulletin from the Pacific Coast and Rocky Mountain States.

Two special bulletins relating to the agricultural population have been issued—one, of 22 pages, entitled "Stability of Farm Operators, or Term of Occupancy of Farms," and the other, of 35 pages, entitled "Age of Farmers, by Color of Operator, Character of Tenure, and Size of Farm." The former was ready for distribution in June and the latter in August, 1914.

Early in August, 1914, the Bureau began the preparation of a special report relating to Negroes in the United States. A preliminary bulletin will soon be issued, and it is expected that the complete report will be published about March 1, 1915. It will show, for the Negro race, the principal census data relating to population, occupations, agriculture, mortality, membership in religious bodies, and marriage and divorce. The figures are being compiled from census publications or other material already in possession of the Bureau. A similar report, based on the census of 1900, was one of the most popular of the Bureau's publications.

Vital Statistics.

During the fiscal year ended June 30, 1914, the Bureau's annual mortality reports for 1910, 1911, and 1912 were issued. These

reports, and particularly those for 1910 and 1911, had been delayed because of the pressure of the Thirteenth Census work. In order to expedite the publication of the 1912 report, the tables showing detailed death rates were omitted. These rates are included in the report for 1913, which has just come from the press.

The Index of Joint Causes of Death, intended for use of registrars of mortality statistics, showing the assignment to the preferred title of the International List of Causes of Death when two or more causes are simultaneously reported, has recently been issued. This publication, an octavo volume of 308 pages, has been "printed as proof," in order to enlist constructive criticism from registrars and others concerned or interested in the recording, transcription, compilation, and publication of mortality data.

An important piece of work now in progress is the preparation (for the first time by any Federal bureau) of a series of life, or mortality, tables, based on the population and mortality statistics of 1900 and 1910, showing "expectation of life" for various elements of the population—male and female, white, Negro, urban, rural, etc.—in the original registration States as they existed in 1900, taken as a group. Certain of these States, ranking high in population, such as New York, Massachusetts, and Michigan, will also be represented individually. These tables are similar to those used by life insurance companies, and their preparation, which is under the charge of Prof. James W. Glover, of the University of Michigan, involves actuarial computation of an intricate character.

During the fiscal year the States of Georgia and South Carolina passed satisfactory death-registration laws, based upon the "model law" recommended by the Bureau of the Census. The enactment of this legislation was due in large part to the efforts of the Bureau.

Statistics of Cities.

The report on general statistics of cities for 1909, a quarto volume of 197 pages, was in page proof on June 30, 1913, and was issued soon thereafter. Up to 1909 this report had been issued biennially, but, owing to the necessity for concentrating the force of the office as far as possible on the work of the Thirteenth Census, the report for that year was considerably delayed, and it was decided not to issue it for 1911 and 1913. The annual reports on financial statistics of cities, however, carry a few statistics of a general character.

The 1911 report on financial statistics of cities of 30,000 and over had also been delayed by the Thirteenth Census work. This

report, a quarto volume of 401 pages, was completed November 15, 1913, and was ready for distribution December 8, 1913.

The 1912 bulletin on financial statistics of cities of 30,000 and over was completed December 15, 1913, and was ready for distribution December 22, 1913. The expert special agents (former officials of the Census Bureau) who were appointed early in the fiscal year to devise plans for expediting the publication of the reports of the Thirteenth Census and of such annual reports as are issued by the Bureau recommended the preparation of this abridged report, in bulletin form, on financial statistics of cities, and the omission of the regular report for 1912. After the completion of the bulletin, however, it was found practicable to issue the regular report. This publication, a quarto volume of 410 pages, was ready for distribution June 6, 1914.

The 1913 report on financial statistics of cities having a population of 30,000 and over was completed during the fiscal year ended June 30, 1914, and was ready for distribution early in September. This publication was issued in the form of a quarto bulletin of 73 pages.

Cotton and Cottonseed.

During the year the Bureau collected and published its regular preliminary and annual statistics relating to cotton ginned, to cotton consumed, imported, exported, and on hand, and active cotton spindles, and to cottonseed and linters. There are now 10 preliminary reports on cotton ginned issued each year, beginning with that relating to August 31 and ending with that for February 28 of the following year. The preliminary reports on stocks held and consumption of raw cotton by warehouses, mills, etc., are published monthly during the entire year. Three preliminary reports on cottonseed crushed and linters obtained are issued each year, the first relating to November 30, the second to December 31, and the third, covering the season's crush, to February 28. These preliminary reports are all distributed in card form. The reports on cotton ginned are published approximately 8 days, those on stocks and consumption approximately 14 days, and those on cottonseed and linters approximately 16 days after the dates to which they relate.

The Bureau also publishes annually two quarto bulletins, one relating to production of cotton, cottonseed, and cottonseed products, with condensed data regarding supply and distribution of cotton, and the other giving more detailed statistics as to supply

and distribution of cotton, together with data for active cotton spindles and exports and imports of raw cotton and its manufactures. The bulletin on the production of cotton and cottonseed products, relating to the crop of 1913, comprised 79 quarto pages and was issued in July, 1914. The bulletin on supply and distribution of cotton for the year ended August 31, 1913, contained 40 quarto pages and was issued November 1, 1913.

Hereafter but one annual cotton bulletin will be compiled. This bulletin will relate both to the production and to the supply and distribution of cotton, and will be ready for distribution about September 15.

Tobacco.

Under authority of an act of Congress approved April 30, 1912, the Bureau makes semiannual collections and publications of statistics of stocks of leaf tobacco held by manufacturers and dealers. The reports for the fiscal year 1914 relate to October 1, 1913, and April 1, 1914, and were issued, in card form, November 13, 1913, and May 9, 1914, respectively.

These statistics are collected almost entirely by correspondence, but the Bureau of Internal Revenue of the Treasury Department renders valuable assistance in correcting the reports and in obtaining returns from establishments which fail to respond promptly to the inquiries of the Census Bureau.

The Bureau's tobacco reports have been generally approved by those interested and have received but little adverse criticism. A special effort is made to publish the figures as soon as possible after the dates to which they refer, and it is gratifying to note that each report since the inauguration of this work has been issued more promptly than the preceding one. In fact, the last report, relating to April 1, 1914, was ready for distribution in only two-thirds the time required for the preparation and publication of the first one, relating to October 1, 1912.

In July, 1914, five representative tobacco planters, dealers, and manufacturers were given appointments as expert special agents and called to Washington for the purpose of discussing improvements in the method of collecting these statistics; and it is the intention to hold a similar meeting of these expert special agents immediately after the publication of the forthcoming tobacco report, which will relate to October 1, 1914, in order that they may examine and criticize the statistics and suggest such changes

in the work as may seem desirable. It is expected that substantial benefit will result from the adoption of some of the suggestions made by these tobacco experts.

Information Furnished by Correspondence.

In addition to the collection and publication of statistics along the various lines already mentioned, the Bureau handles numerous requests from local governments and from individuals for information of one kind and another. More than a thousand such requests for population data alone were received and answered during the year. A great many requests were also received for genealogical data and for transcripts of census records regarding ages of soldiers, to be used in connection with applications for pensions or increases of pensions.

PLANS FOR FUTURE WORK.

In addition to conducting the several annual inquiries already discussed, the Bureau of the Census will, in 1915, take its regular quinquennial census of manufactures and its first quinquennial census of agriculture.

Census of Manufactures.

This census, the field work for which will begin early in 1915, will relate to the calendar year 1914. Preliminary work, consisting largely in the preparation of index cards for listing the manufacturing establishments, was commenced in December, 1913, and will continue throughout the present calendar year. A special effort—which, it is expected, will be attended by a large measure of success—is being made to unify the Census Bureau's classifications with those of the Bureau of Foreign and Domestic Commerce, in order to make possible a closer approach to complete comparability of the former Bureau's statistics of manufactures and the latter's statistics of exports and imports.

Another feature of the preparatory arrangements for this census, and one which distinguishes it from preceding censuses, is the effort that has been made to secure the cooperation and assistance of prominent manufacturers and of representative commercial and trade bodies of all kinds. Letters have been written to such manufacturers and to all such organizations of which the Census Office has any knowledge, inviting cooperation and requesting suggestions, particularly in reference to the inquiries carried on the various special or supplementary schedules.

A trip was made during January, 1914, by the Director and the Chief Statistician for Manufactures, to Philadelphia, New York, and Boston, where conferences were held, with very gratifying results, with the leading commercial and industrial organizations of those cities; and a similar trip through the eastern North Central States, extending as far south and west as St. Louis, has been arranged for the latter part of 1914, from which equally satisfactory results are anticipated. Many of these organizations have, at the request of the Census Bureau, passed resolutions to the effect that they recognize the importance of the census of manufactures and will endeavor in every way possible to assist in and expedite the work.

The aid of Members of the Senate and House of Representatives, of the Department of Agriculture, of the Bureau of Corporations, and of State statistical organizations has also been enlisted.

In short, more has been done already, and will be done, in these directions in preparation for the census of 1915 than has been undertaken in connection with any preceding census of manufactures; and it is confidently expected that the results will be published more promptly and will be of greater value than ever before.

Census of Agriculture.

The Thirteenth Census act, passed in 1909, provided for a census of agriculture to be taken in 1915 and at 10-year intervals thereafter. This intercensal inquiry will be much more limited in scope than the agricultural inquiry made in connection with each decennial census of population. Estimates for the appropriation needed will be submitted to Congress at its next regular session, together with requests for such slight changes in regard to date of enumeration, scope, and method as may seem desirable at that time.

Statistics of Federal Employees.

The Bureau has under consideration the compilation of statistics of the executive civil service similar in scope to those in Bulletin 94, Statistics of Employees: Executive Civil Service of the United States: 1907. This work could be taken up in connection with the preparation of the next edition of the Official Register, which will relate to July 1, 1915, and the results could be published in bulletin form after the issuance of the Register. In

this bulletin the employees of the executive civil service, exclusive of postmasters and certain other specified employees, would be classified according to sex, race and nativity, age, marital condition, character of appointment with reference to the civil-service rules, character of work, period of service, compensation, State or Territory from which appointed, and military or naval service in the Civil or Spanish-American War.

There is a considerable demand for statistics of this nature, which are not now available in any Government publication. The extra data needed for their compilation could be obtained from the departments and independent offices, in connection with the preparation of the Official Register, at a comparatively small increase of expense; and it is believed that their usefulness would furnish ample justification for undertaking the work.

OFFICE FORCE.

The appropriation act for the fiscal year 1914 provided for 621 permanent employees of the Census Bureau; the number provided by the act for 1915 was 589. This reduction, with the consequent material decrease of expense, was due to the removal of the Bureau to the new Department of Commerce building and the consequent consolidation of its subclerical or labor force with that of the Department. No material change was made in the administrative and clerical force.

APPROPRIATIONS AND EXPENDITURES.

Financial Statement, Fiscal Year 1914.

Administrative:

| | | |
|--|--------------|---------------|
| Salaries for administrative places | \$34,963. 61 | |
| Salaries for Division of Correspondence and Mail | 21,148. 48 | |
| Salaries for library | 5,362. 60 | |
| Salaries for watch, labor, and char forces | 25,740. 51 | |
| Rent | 21,000. 00 | |
| Stationery | 3,218. 32 | |
| Miscellaneous expenses | 21,590. 69 | |
| Books and periodicals | 490. 73 | |
| Total | | \$133,514. 94 |

Machine shop:

| | |
|-----------------------------------|------------|
| Salaries | 10,739. 43 |
| Materials, supplies, etc. | 34. 46 |

| | |
|-----------------|------------|
| Total | 10,773. 89 |
|-----------------|------------|

| | |
|---|------------|
| Geographer's Division: Salaries | 20,697. 84 |
|---|------------|

Thirteenth Census work:

Population—

| | |
|--------------------------------|---------------|
| Supervision..... | \$11, 291. 64 |
| General and State reports..... | 19, 141. 13 |
| Occupations..... | 114, 052. 44 |
| Tenure of homes..... | 31, 124. 56 |
| Miscellaneous work..... | 9, 546. 68 |

Total..... \$185, 156. 45

Agriculture—

| | |
|--------------------------------|------------|
| Supervision ^a | 7, 780. 11 |
| General and State reports..... | 8, 553. 63 |
| Color, tenure, and size..... | 1, 243. 88 |
| Plantations..... | 194. 04 |
| Irrigation..... | 116. 66 |

Total..... 17, 888. 32

Manufactures—

| | |
|--------------------------------------|-------------|
| Supervision ^b | 9, 445. 77 |
| Completion of manufactures reports.. | 11, 382. 36 |
| Industrial districts..... | 2, 281. 66 |
| Mines and quarries..... | 2, 541. 39 |

Total..... 25, 651. 18

Institutions..... 22, 715. 17

Revision and Results..... 16, 769. 30

Publications..... 9, 950. 28

Negroes in the United States..... 695. 56

Chinese and Japanese..... 216. 67

Total..... \$279, 042. 93

Annual investigations:

| | |
|----------------------------|--------------|
| Cotton..... | 257, 100. 03 |
| Tobacco..... | 10, 239. 29 |
| Forest products..... | 3, 670. 78 |
| Electrical industries..... | 73, 280. 87 |
| Vital statistics..... | 82, 423. 41 |
| Statistics of cities..... | 66, 445. 36 |

Total..... 493, 159. 74

Wealth, debt, and taxation..... 151, 477. 86

Census of manufactures, 1914..... 32, 804. 89

Official Register..... 3, 911. 84

Miscellaneous..... 7, 642. 33

Grand total..... 1, 133, 026. 26

^a Includes cost of supervision for wealth, debt, and taxation.

^b Includes cost of supervision for forest products, cotton, tobacco, electrical industries, and preliminary work on census of 1914.

| Title of appropriation. | Appropriation. | Expenditure. |
|--|----------------|----------------|
| Salaries, Bureau of the Census, 1914..... | \$711, 240.00 | \$693, 245.53 |
| Tabulating machines, Bureau of the Census, 1914..... | 12, 500.00 | 10, 773.89 |
| Collecting statistics, Bureau of the Census, 1914..... | 6 404, 000.00 | 382, 707.11 |
| Rent, Bureau of the Census, 1914..... | 22, 080.00 | 21, 000.00 |
| Purchase of books of reference and periodicals..... | 500.00 | 490.73 |
| Contingent expenses..... | 25, 000.00 | 24, 809.01 |
| Total..... | 1, 175, 320.00 | 1, 133, 026.26 |

* Includes unexpended balance of appropriation for collecting statistics, Bureau of the Census, 1913, \$30,000, transferred to appropriation for 1914 by urgent deficiency act of Oct. 22, 1913.

Appropriations, Fiscal Year 1915.

The appropriations for 1915 amounted to \$1,537,460. There was a decrease of \$21,280 in the item for salaries, due in part to the discontinuance of one clerical position and the transfer of certain others to the roll of the Department of Commerce, but principally to the discontinuance of a number of subclerical positions and the transfer of others to the roll of the Department as a result of the removal of the Bureau of the Census from its old quarters to the new Department building.

The appropriation for tabulating machines was reduced to \$12,000.

The item for collecting statistics was increased to \$835,000, in order to provide for the quinquennial census of manufactures, to be taken during the calendar year 1915.

The item for rent was discontinued by reason of the removal of the Bureau of the Census to the new Department building.

The appropriation for the purchase of books and periodicals remained unchanged.

The item for contingent expenses was discontinued, such expenses now being paid from the appropriations for the Department of Commerce.

PUBLICATIONS ISSUED.

During the fiscal year the Census Bureau issued the following reports in the form of bound quarto volumes:

| Population, 1910: | Date issued. |
|--|----------------|
| Vol. I. General Report and Analysis. 1,369 pages..... | Jan. 5, 1914 |
| Vol. II. Reports by States, with Statistics for Counties, Cities, and Other Civil Divisions—Alabama to Montana. 1,160 pages..... | Aug. 23, 1913 |
| Vol. III. Reports by States, with Statistics for Counties, Cities, and Other Civil Divisions—Nebraska to Wyoming; Alaska, Hawaii, and Porto Rico. 1,225 pages..... | Sept. 27, 1913 |

| | Date issued. |
|--|----------------|
| Agriculture, 1910: Vol. V. General Report and Analysis. 927 pages... | Nov. 21, 1913 |
| Manufactures, 1909: | |
| Vol. VIII. General Report and Analysis. 845 pages..... | Sept. 15, 1913 |
| Vol. X. Reports for Principal Industries. 975 pages..... | Dec. 30, 1913 |
| Mining, 1910: Vol. XI. Mines and Quarries. 369 pages..... | Dec. 30, 1913 |
| General Statistics of Cities, 1909. 197 pages..... | Sept. 18, 1913 |
| Financial Statistics of Cities, 1911. 401 pages..... | Dec. 8, 1913 |
| Financial Statistics of Cities, 1912. 410 pages..... | June 6, 1914 |
| Mortality Statistics, 1910. 611 pages..... | Oct. 2, 1913 |
| Mortality Statistics, 1911. 572 pages..... | Dec. 17, 1913 |
| Mortality Statistics, 1912. 382 pages..... | Jan. 5, 1914 |
| Benevolent Institutions, 1910. 411 pages..... | Jan. 6, 1914 |
| Official Register of the United States, 1913. 876 pages..... | Jan. 7, 1914 |

In addition to the foregoing reports, there were issued during the year 84 quarto bulletins and other unbound or paper-bound publications, with a total of 4,298 pages; 7 octavo pamphlets, with a total of 478 pages; 25 preliminary reports, in card form, relating to cotton and cottonseed; 2 semiannual reports, in card form, relating to stocks of leaf tobacco; and approximately 250 press summaries of the Bureau's reports and bulletins, in printed or multigraphed form, varying in length from three-fourths of a column to a column. These summaries were distributed to an average of 1,200 to 1,500 daily newspapers and oftentimes to numerous weeklies as well. They were also sent to State officials, manufacturers, and others interested in the particular industries or subjects covered.

BUREAU OF FISHERIES.

Propagation of Food Fishes.

The fiscal year 1914 was, in general, the most successful in the entire history of fish culture under the Federal Government. This success did not depend on mere numbers of fish produced and distributed, unprecedentedly large though the numbers were, but should be measured also by the fitness for survival and special adaptability for the waters in which an increasingly large percentage of the output was planted. This result has been achieved without any increase in outlay and has depended on augmented efficiency, rigid economy, and development of existing facilities and resources. It is noteworthy that, whereas the cost of fish produced and planted was \$403 per million in 1894 and \$287 per million in 1904, the cost was reduced to \$136 per million in 1914.

The fish-cultural activities of the Bureau were conducted in 34 States, the Territory of Alaska, and the District of Columbia, at 36 permanent hatcheries, and 94 auxiliary and egg-collecting stations.

Upward of 40 of the most valuable food and game fishes of the fresh and salt waters of the country were handled, and the output reached the enormous total of 4,047 millions. Of this number the migratory food fishes of the Atlantic coast streams numbered 485 millions, the commercial fishes of the Great Lakes 1,020 millions, the salmons of the Pacific seaboard 223 millions, the food fishes of the North Atlantic coast (including the lobster) 2,276 millions, and the fishes of the minor interior waters the remaining 43 millions.

Plants of food fishes in rivers, large lakes, and other public waters and in many thousands of small lakes, ponds, and streams were made in every State and Territory. A majority of the plants in minor waters were on farms. The distribution of the output necessitated over 130,000 miles of travel by the special cars of the Bureau and 480,500 miles by detached messengers. All transportation was paid for except about 96,000 miles, which was donated by certain railroads.

So great is the popularity of this work and such the demand for fishes for stocking public and private waters in all parts of the

country that the Bureau is unable to produce certain fishes in sufficient numbers to satisfy the requirements. This is particularly true of fishes adapted for cultivation in ponds. Five new hatcheries already authorized will meet some of the more pressing needs, but additional hatcheries in selected regions are urgently demanded, and such have been recommended to the appropriate committees of Congress. Of the five new stations in question, the two in Kentucky and South Carolina have progressed as far as the available funds permitted, and can not be completed without additional appropriations; work on those in Wyoming and Utah has been delayed by unexpected difficulties encountered in obtaining a clear title to the land, but the construction of the Wyoming station, to be located at Saratoga, will now proceed; no site for the remaining hatchery, in Rhode Island, has yet been selected, but it is the intention to establish a salt-water plant adapted for handling the important economic species of the southern New England and Middle Atlantic coasts.

Several experiments in the acclimatization of aquatic creatures have been continued on a large scale in the expectation that important economic results may be attained. Special mention may be made of the planting of Pacific salmon on the coast of Maine and of Atlantic lobsters on the coast of Washington. During the fiscal year over seven million young humpbacks or pink salmon, hatched from eggs brought from Puget Sound, have been planted in selected streams in Maine, and similar deposits will be made from year to year until the fish is established in its new environment. In November, 1913, over four thousand lobsters, many of them egg-bearing, were transferred with little loss in a refrigerator car from the station at Boothbay Harbor, Me., to Seattle, and thence taken by steamer to the San Juan Islands, where they were deposited in excellent condition at previously selected points.

Frequent embarrassment has arisen in the past from persistent demands for the stocking of certain waters with fish which, in the judgment of officials immediately responsible for the outcome of the work, are unsuitable or undesirable for such waters. These demands are often strongly backed in the best of good will by Senators and Representatives in Congress without full knowledge of the facts or without appreciation of the harm that may result. In order to protect the native fishes from the possible damage that may come from the introduction of inharmonious species, a policy has been adopted, and will be strictly adhered to, under which favor-

able consideration will not be given to applications for fishes for stocking purposes when their known habits and the experience of fish culturists indicate that injury to the native fishes will result. This applies with special force to the planting of predatory spiny-rayed game fishes of the East in the salmon and trout waters of the Pacific States. It may be noted that the stand taken has received the approval of the fishery authorities and commercial organizations in the Western States; and it is hoped that the policy will be upheld by persons interested in or concerned with the preservation of the supplies of native food and game fishes in all parts of the country.

The Fishing Industry.

Through its field inquiries and local fishery offices, the Bureau keeps in close touch with the commercial fisheries. The number of fishery agents is too small, however, to permit a general canvass of all of the fisheries of the country in one season. The plan has therefore been adopted each year of concentrating on some important branches of the industry, obtaining complete statistical and other information regarding them, and issuing to the trade bulletins giving the results of the inquiries. During the fiscal year 1914 such field canvasses were addressed to the menhaden industry, the fresh-water mussel fishery, the pearl-button industry dependent thereon, and the tunny fishery of California.

The menhaden is the most abundant economic species on the east coast of the United States, and supports a very important industry, the fish being used for conversion into oil and fertilizer. The menhaden fishery, which is conducted chiefly with purse seines, has for many years attracted general public attention and local criticism because of the possible injury to food fishes resulting (1) from the withdrawal of enormous quantities of menhaden, on which various important market fishes largely subsist, and (2) from the reported actual capture of such market fishes with the menhaden seines and their utilization at the factories. Accurate data showing the extent and condition of this industry are therefore very desirable, and such were obtained during the first half of the fiscal year for the calendar year 1912, immediately preceding.

The fishery is prosecuted from Maine to Florida, and supplies raw material to 48 factories, a majority of which are in Virginia and North Carolina. Nearly six thousand men were engaged in the industry in 1912, and the capital invested amounted to nearly \$8,000,000. The yield was larger than in any previous year for

which there are statistics, consisting of more than a billion fish, weighing 637 million pounds, valued in the fresh condition at \$2,210,000. About five million pounds of other fish reached the factories; these consisted chiefly of sharks, skates, sea robins, and alewives, the last representing about 90 per cent and coming mostly from Chesapeake Bay. The manufactured products comprised over 88,000 tons of scrap and 6,650,000 gallons of oil, having a value of \$3,690,000.

A canvass of the mussel fishery in streams tributary to the Gulf of Mexico from the Ohio River southward was made during the year, in connection with an inquiry into the pearl-button industry of the entire country. The mussel fishermen in the region named numbered nearly five thousand and took shells which, with the contained pearls, were valued at nearly half a million dollars. These shells were disposed of to factories located in 20 States and were converted into buttons and by-products worth \$8,880,000. It is this important industry, which had its beginning in the United States as late as 1891, that the Bureau is aiding through the operations of the station at Fairport, Iowa, through practical field work on all streams where suitable mussels are found, and through counsel to fishermen, manufacturers, and legislators as to the best means for conserving and utilizing the natural supply of raw materials.

Until very recently no use was made of the abundant supply of tunnies on the coast of California. Within a few years, however, the canning of one species of tunny has been started and already nine canneries have been established in southern California. The annual pack now reaches several hundred thousand cases, and meets with ready sale in all parts of the country. Formerly the entire stock of preserved tunny consumed in the United States was imported from Europe. A special investigation of the fishing and canning methods in California has been undertaken and further studies of the abundance and distribution of the fish which supports the industry are planned. It seems probable that this and related species which are now neglected on other parts of our coast may advantageously be canned or otherwise prepared, and the Bureau is working to this end.

For the great high-sea vessel fisheries centering at Boston and Gloucester the most detailed information has been collated and issued monthly to the trade in the form of one-sheet bulletins. These records, which now cover a long period of years, are invaluable for determining the condition and trend of the most important

offshore fisheries of the country and for showing the relative value of the various grounds resorted to by American vessels.

In the calendar year 1913 these vessels brought into Boston and Gloucester 8,829 fares or trips of fish, aggregating 162,000,000 pounds, valued at \$4,980,000. Compared with the previous year there was an increase of 1,180 trips, a decrease of 20,000,000 pounds of fish landed, and an increase of \$200,000 in the value of the catch. Cod, cusk, haddock, hake, and herring were taken in less quantities, while halibut, pollock, mackerel, and swordfish showed an increase.

The investigation of the New England otter-trawl fishery has been actively pushed, and a report thereon, with recommendations, will shortly be presented to Congress. The field work was brought to a close in December, 1913, and the task of collating and interpreting the mass of information obtained, and of making a critical survey of the trawl fisheries of other countries, was intrusted to a special committee of Bureau officials.

Coastal and High-Sea Investigations.

The study of the biology, physics, and chemistry of the sea, which comprises the science of oceanography, has attained great importance in recent years because of its application to practical fishery problems in all parts of the world but more particularly in the North Sea and other waters on the coast of western Europe. The Bureau of Fisheries, acting independently and in collaboration with the International Council for the Exploration of the Sea, has recently improved its equipment for oceanographic work, and is systematizing its methods and laying plans along lines which will be likely to yield the best and most immediate results. While much of this work appears to have only a superficial or remote bearing on practical questions, as a matter of fact it affords data which are indispensable for a proper interpretation of the phenomena presented by the economic creatures of the coastal and offshore waters, and for a comprehensive administration of the sea fisheries.

In the summer of 1913 the auxiliary schooner *Grampus* was engaged in investigations extending from the Gulf of Maine to the Capes of the Chesapeake; and in the spring of 1914 the Bureau cooperated with the Coast and Geodetic Survey in an expedition of the steamer *Bache* from the Capes of the Chesapeake to Bermuda and thence to the coast of Florida, the Gulf Stream being covered

by a number of lines of investigation as far south as Key West and Habana. A large amount of valuable data and specimens was collected, and it is evident that this work will yield much new information regarding ocean currents, salinities, and temperatures, all of which have an important influence on the distribution of fishes and the site of fishing operations. In addition, there has been a decided increase in knowledge of the spawning grounds, early life, and food of certain fishes.

Pursuant to an agreement reached at the International Maritime Conference in London, the Department called on the Bureau in the spring of 1914 to participate in the ice patrol of the trans-Atlantic steamship lanes, by placing an oceanographic observer on the revenue cutter *Seneca*, which had been assigned to this work. It is believed that investigations of this character will throw much light on the source and movements of icebergs under the influence of currents; and it is possible that the floating animals and plants, which constitute the "plankton" and which can be traced to their source wherever found, will afford better criteria than the physical phenomena, which are obscured by the blending and interference of the various oceanic currents. Inasmuch as most of this work is done on or near the Grand Banks of Newfoundland, it yields information that is valuable to the fisheries as well as to navigation.

While engaged in oceanographic investigations, the *Grampus* discovered the presence of beds of the giant or smooth scallop in deep water off the coasts of the southern New England and Middle Atlantic States. Later the vessel was detailed to make a more thorough examination, which disclosed the existence of an abundant and hitherto unsuspected supply of this valuable shellfish, which always meets with ready sale. One of the most productive of the beds reaches within 40 miles of Sandy Hook; and as it covers a large area and is readily accessible, it is believed that a lucrative fishery may be developed. An illustrated circular, describing the scallop grounds and calling attention to the possibilities, was issued immediately.

A number of years ago the Bureau demonstrated the abundance of sea bass or blackfish on a fishing bank lying off Beaufort, N. C. The information was not brought prominently to the attention of the local fishermen, and the existence of this fishing ground was disregarded. In 1913, however, as a part of the increased activity at the Beaufort fisheries station, certain of the more enterprising local fishermen were induced to test this bank, with results so

promising that the *Fish Hawk* was detailed for further investigations. A number of adjacent banks were found, and a circular was issued giving information as to their location and productiveness. The outcome has been the establishment of a remunerative and growing sea-bass fishery. Arrangements have been made for placing a permanent buoy on the principal bank to aid the fishermen in finding the best grounds, and a further survey will be made in the hope of locating new grounds.

During the winter and spring of 1914 the *Fish Hawk* conducted biological and physical investigations in Chesapeake Bay in connection with a study of the habits and distribution of the fishes of that region. This work will have to be continued over a series of years, but already certain significant information has been obtained which may explain the heavy winter death rate among young food fishes and reasons for the irregularities in the runs of various migratory species.

In response to requests from fishermen and other persons on the coast of Oregon and Washington, the Bureau, in the spring of 1914, began an investigation to determine whether the supply of halibut and other fish on certain grounds lying a considerable distance offshore was sufficiently abundant and regular to warrant the fishermen in equipping themselves for a large fishery. The steamer *Albatross*, with her regular personnel supplemented by a crew of experienced halibut fishermen, was employed for this purpose, and the work had not been completed at the close of the fiscal year. Valuable information, some of it of a negative character, has been obtained, but the investigation has not progressed sufficiently far to warrant a definite statement as to the possibilities of the grounds in question.

Various other marine-fishery studies have been undertaken and were in progress at the close of the fiscal year. Among these was an investigation of the shrimp of the Gulf and South Atlantic coasts for the purpose of determining what regulative legislation and other kinds of conservation are necessary in order that the supply of this valuable crustacean may be preserved.

Surveys and Investigations of Lakes and Streams.

There has been the usual field work addressed to fresh waters in all parts of the country. These investigations in some cases have been precedent to fish culture or the systematic stocking of waters with desirable food and game fishes, and in others have been related to fishing operations.

In cooperation with the Wisconsin Geological and Natural History Survey, the Bureau has continued the investigation of the interior lakes of the State in an effort to establish the fundamental biological and physical conditions of lake life. The work is being conducted in great detail and will establish a basis for the better understanding of lake phenomena in other regions. In Lake Champlain a biological and fishery investigation has been commenced in cooperation with the Vermont Fish Commission, the primary object being the feasibility of conducting commercial fishing operations for certain food fishes without detriment to the sporting interests, which are a valuable asset to the people of Vermont and New York.

The construction of the great dam at Keokuk, Iowa, has produced a long, narrow body of water known as Lake Cooper, which bears a close resemblance to Lake Pepin, a natural expansion of the Mississippi River in Wisconsin and Minnesota. The fisheries of Lake Pepin are the most important in the entire river, and it is probable that Lake Cooper, under proper treatment, may be made to serve a very useful purpose supplemental to and in no way interfering with its primary use for the generation of electric power. With this in view, the lake has been placed under observation, and there have been begun studies of the minor life on which fishes and other economic forms ultimately subsist, in the expectation that the conditions may be found suitable for the planting of fishes and mussels. Coincidentally there has been made an investigation of the effects of the dam, turbines, and locks on the movements of migratory fishes.

In continuation of the systematic survey of the mussel resources of the Mississippi Basin, the upper Missouri River drainage system and the Ohio River Valley have been brought under investigation. The special publications covering the results of this work have been very favorably received by the pearl-mussel interests, and in some cases have opened up new fields for industrial enterprise. These studies have afforded data on which to base recommendations for protection of the mussel fisheries, and the steps necessary for the conservation of the mussel resources have been embodied in a report which has been brought to the attention of all the States interested.

The salmons of the Pacific streams have continued to receive attention, and a new and systematic inquiry into the life history of the species inhabiting the Columbia and Sacramento Rivers

has been begun. This will involve mainly the study of the scales, a very valuable new means of determining important facts in the lives of fishes.

Operations at the Fisheries Laboratories.

The marine laboratories at Woods Hole, Mass., and Beaufort, N. C., and the fresh-water laboratory on the Mississippi River at Fairport, Iowa, have been actively utilized for investigations, researches, and experiments of either immediate or prospective value to the fishing industries.

At Woods Hole, in addition to the usual studies of the habits, food, abundance, and parasitic affections of fishes, investigations of the dogfish and the sea mussel were conducted during the summer of 1913 as a part of the campaign for the commercial utilization of these waste products. Among the various other matters under consideration was the cause of "green gill" in oysters—an affection which, while entirely harmless, causes large losses to oyster growers because of popular prejudice. Other studies of the oyster were addressed to the life histories of some common oyster enemies, with a view to the discovery of a stage or habit through which they may prove vulnerable to measures for their destruction. There is a growing public demand for definite information regarding the effects on fishes of various water pollutions, and laboratory tests were made as to the toxicity of various mineral substances likely to be discharged into streams. Closely connected with this subject was a research into the oxygen requirements of fishes, especially in relation to the discharge of sewage and other decaying organic matter which, by its oxidation, reduces or entirely consumes the oxygen supply available for fishes.

At Beaufort steps have been taken looking to the utilization of the laboratory for practical fish hatching at a time when the other activities are reduced, and useful information has been obtained regarding the spawning of a number of important fishes whose cultivation seems desirable.

Owing to the growing demand on the supply of edible crabs in the Beaufort region and elsewhere along the east coast and the apparent depletion of some of the most productive grounds, studies and experiments have been begun for the purpose of determining the necessary conservation measures that will least disturb the fishery.

There has been a continuation of the tests, that have been in progress for several seasons, to determine the practicality of protecting piling and other wood from attacks of marine borers by the use of impregnating solutions of metallic salts and other substances.

Progress has been made in the culture of the diamond-back terrapin at Beaufort, where the feasibility of breeding and rearing under artificial conditions has been amply demonstrated. The recent experiments have been directed to improvements in the methods of feeding and selective breeding with a view to the development of a superior race. The practical results already attained have been such as to lead to the establishment of a near-by terrapin farm, under private auspices, and the outcome confirms the view that terrapin culture is commercially profitable.

Limitations imposed by law as to the manner of acquiring the site for the fisheries laboratory authorized to be located on the Gulf coast of Florida have delayed the establishment of that station. A desirable tract of land near Key West having been donated and this region having been found to afford superior facilities, Congress was asked to amend the law so as to sanction the acceptance of the property directly from the owners. An item to this end was inserted in the act making appropriations for the Bureau which became a law in August, 1914.

The newly established Fairport station, which is one of the best-equipped institutions of the kind in the world, has been made ready for the important practical work for which it was established, and supplies a deficiency which has retarded the proper development of the fisheries of the Mississippi Valley. The laboratory admirably combines facilities for research and experiment with practical equipment for extensive operations in mussel and fish culture, and has already justified the wisdom of Congress in providing a station whose utility was quite uncertain. In addition to practical mussel culture on a large scale, the laboratory activities have included the determining of the conditions under which three important species of mussels may be propagated; material progress in rearing young mussels and in fixing the rate of growth of both young and old; experiments looking to the utilization of mussel meats, of which a very large quantity is now wasted; researches into the conditions controlling the production of lustrous and therefore valuable shells; and various other lines of progressive work which is necessary to a full utilization of the mussel resources of the country and has enlarged the field of mussel culture.

The propagation of pearly mussels has already assumed noteworthy proportions. In the fiscal year 1914, the second season of its active prosecution, over 277 million larval mussels were planted in the Mississippi River and its tributaries in Iowa, Minnesota, Wisconsin, Indiana, and Arkansas. To carry this number of young mussels, more than 167,000 fishes were infected and then liberated in the streams. Over 66,000 of these fishes were rescued from overflowed lands, where they would otherwise have perished; and as all of them were of breeding age and mostly of valuable species, this incidental feature of the mussel work would in itself largely justify the expenditures incurred. During the several weeks when the larval mussels are carried as parasites in the gills and on the fins of fishes, the latter roam widely and doubtless give the young mussels a very general distribution throughout the entire Mississippi Basin. The experience now being gained at the laboratory will permit a vast extension of this work at diminishing unit cost, and the results will in due time be unmistakable.

Protection of Alaska Fisheries.

The welfare of the vast fishing industry in the coastal waters and streams of Alaska depends largely on the existence of proper protective laws and on their adequate enforcement. New legislation is demanded in order to meet new conditions, and a general revision of the laws under which the Bureau is now operating would be desirable. Under rational laws that will recognize the fundamental requirements of the aquatic creatures and not unduly restrict the industry, and with the large discretionary powers now vested in the Secretary of Commerce, it is felt that the fishery resources of Alaska will remain unimpaired for an indefinite period. Furthermore, in view of the large Federal expenditures on behalf of the fisheries of Alaska, provision should be made for increased revenue therefrom; this can be secured without the imposition of any burdensome tax on any branch of the industry.

During the year the fishery laws and the regulations made thereunder have been enforced to the full extent of the facilities provided by Congress, and supplemental aid in this work has been rendered by fur wardens and by employees of the fish-cultural force temporarily detailed for the purpose. It is not claimed that the service has been satisfactorily performed, inasmuch as a material increase in personnel is necessary for the proper patrol of the long coast line, but the agents have been active

and zealous, and it has even been possible to extend the inspections along certain lines.

During the season of 1913 the Bureau was for the first time provided with a vessel of its own with which to make some inspections and patrol a portion of the coastal waters. This vessel, the *Osprey*, a secondhand steamer 72 feet long, was put into commission in July, 1913, and has since been in continuous service in southeast Alaska. In the period of most active salmon fishing the operations of this vessel were supplemented by a number of chartered power boats and by the use of a launch attached to the Yes Bay hatchery. This is the only part of Alaska in which any approximation to an adequate enforcement of laws was possible; and additional vessel and boat facilities are most urgently demanded. It is gratifying to note that these have in part been provided in the act making appropriations for the fiscal year 1915.

The large business interests which are at stake and the vast supplies of food and other products which are involved in the perpetuation of the Alaskan fisheries are well known to many persons but are not fully realized by the general public. The weighty responsibility of administering the fisheries in a proper manner is appreciated by the Bureau, and the granting of suitable personnel and facilities is an urgent duty now incumbent on Congress.

In 1913 the fishing industry of Alaska gave employment to more than 21,700 persons, including over 4,000 natives. The investment in fishing property exceeded \$37,000,000, of which \$34,953,000 represented the salmon industry. The products were valued at about \$15,740,000. The catch of salmon aggregated 59,915,000 fish, from which there were prepared 3,739,000 cases of canned fish valued at \$13,531,000 and miscellaneous products valued at \$917,600. Fewer canneries were in operation than in 1912, and there was a decrease in the salmon yield and in the canned output. In southeast Alaska the run of red salmon was unusually light, but the supply of humpback and dog salmon was large. The general run in central Alaska was below normal, and humpbacks were scarce, while the early fishery for king salmon in Cook Inlet was good. In western Alaska, with fisheries located principally in the Bristol Bay region, there was the best known run of red salmon.

The census of spawning red salmon ascending Wood River was continued in 1913, and showed an increase in the run amounting to 100 per cent as compared with 1912. The figures, while indi-

cating less than one-third the supply that was present in 1908, are not conclusive and should be supplemented by data for other years. It is much to be regretted that this important and unique work, involving the actual enumeration of the entire run of salmon to the spawning grounds of a large stream, had to be abandoned in 1914, owing to the delay in the passage of the appropriations.

The five private salmon hatcheries in operation in 1913 liberated 77,997,000 red salmon fry, and earned for their owners tax exemptions on canned salmon amounting to \$31,197. The two Federal hatcheries produced 50,488,000 red-salmon fry and 16,834,000 humpback fry, and in addition supplied 2,000,000 red-salmon eggs to the Oregon Fish Commission.

Fur-Seal Service.

The important duties and responsibilities of the Department on and in connection with the Pribilof Islands received special attention throughout the year. The annual shipment of supplies required for the support of the native inhabitants of the islands and for the maintenance of Government property were delivered by a chartered vessel in the early part of the fiscal year. The medical and sanitary needs of the natives, which are constant and increasing, have been met as far as the resources of the Department permitted; and schools for the native children have been maintained under efficient teachers.

In the spring of 1914, when the shipment of the usual supplies for the seal islands was under consideration, it was decided to make the purchases in Seattle, instead of San Francisco, as heretofore. The Department, however, is not committed to any particular market, and will hereafter procure supplies wherever the conditions are most advantageous as regards prices and shipping facilities.

The wireless telegraph station established and maintained by the Navy Department on St. Paul Island was in operation throughout the year, and is indispensable as providing the only means of communication during about two-thirds of the year. The Navy Department has also a small wireless station on St. George Island, enabling that island to communicate with St. Paul. Increased economy and efficiency in administration are secured through this arrangement, and the depressing isolation to which the Department's officials are subjected is considerably relieved. During a large part of the year the wireless station on St. George Island was

in charge of the school-teacher assigned to the island, this service being voluntarily assumed in addition to his regular duties.

The land killing of seals being restricted by law to the immediate requirements of the native inhabitants of the islands, the number of young male seals authorized to be taken during the season of 1913 was tentatively fixed at 3,000; later, in the fall and winter of 1913, permission to take additional seals for native food was given. This limit was not reached, but the needs of the natives appear to have been practically subserved; the agent on St. Paul reported the supply of seal meat to have been ample, while the agent on St. George Island advised that more meat could have been used in fall and winter had the seals been available at that time.

The annual shipment of sealskins was made in August, 1913, on the chartered vessel that carried supplies to the islands. Up to that year the sales of Alaska skins had always been made in London. The Department, however, felt that economic and other considerations justified the attempt to establish an American market for this strictly American product which is largely used by the American public. It was therefore decided to initiate the selling of the Government's fur-seal skins in this country, and satisfactory arrangements to this end were made with the firm of Funsten Bros. & Co., of St. Louis. The available skins numbered 2,296, of which 1,896 were sold at public auction in St. Louis on December 16, 1913. The remaining 400 skins were withdrawn from sale at the request of the chairman of the Committee on Expenditures in the Department of Commerce, House of Representatives, and these skins were unsold at the close of the fiscal year. The gross proceeds of the sale were \$54,579, an average price of \$28.786 per skin; the net proceeds were about \$50,950. Taking into consideration the extremely unsettled condition of the general fur trade of the world and the rather poor quality of the skins as a whole, the outcome was regarded as satisfactory. The sale was attended by many buyers from Europe and America and attracted much attention.

It is a pleasure to refer to the efficient patrol of the North Pacific Ocean and Bering Sea maintained by vessels of the Revenue-Cutter Service throughout the season when pelagic sealing operations are possible. These vessels incidentally render an invaluable service to the Department by transferring officials and mail to and from the seal islands, and by transporting limited quantities of supplies.

The fur-seal question has continued to be a subject of public discussion, but the Department is not involved therein, except in so far as it has been criticized for the rigid enforcement of the law and for the exercise of its discretionary power over the killing of seals for the use of the natives in accordance with the evident spirit of the law. No question whatever relative to the merits or demerits of the existing close-time law has been presented to the Department by either Congress or the President, and no action in regard to the abrogation or modification of that law has been incumbent on the Department up to this time. In the very short period that has elapsed since the law went into operation and its effects could be gauged, the full duty of the Department seems to have been performed by ascertaining and publishing the facts as to the recuperation of the herd.

In the latter half of the fiscal year, and two years after the suspension of pelagic sealing, the Department determined to undertake an exhaustive inquiry, under competent jurisdiction, regarding the condition of the herd, the effects thereon of the sealing convention and the law of August 24, 1912, giving effect thereto, the operation of the close-time feature of that law, and the entire subject of the relations and the responsibility of the Government toward the seals, foxes, and other animals of the Pribilofs as well as toward the native inhabitants of the islands.

The primary object of this inquiry was to provide the Department with data on which could be based such representations to Congress as the facts demanded. It was obviously the proper course of procedure to employ for this purpose persons who were not involved in the seal controversy that has been waged with little intermission since 1890. The desire of the Department to obtain information through new agencies implied no criticism of previous instruments but rather a belief, based on assurances from various sources, that a new viewpoint would be welcomed by everyone concerned and would be approved by all persons interested in seeing the facts established.

Accordingly, on the recommendation of the Commissioner of Fisheries, arrangements were made for the nomination of three specialists not connected with the Department, not previously concerned with the fur seals, and selected by outside agencies for the particular inquiries in hand. In compliance with my request to the Secretary of Agriculture that he designate a duly qualified person versed in the breeding and other habits of wild and domestic

animals to serve as a special assistant of the Department, Mr. Edward A. Preble, of the Bureau of Biological Survey, was named. The Secretary of the Smithsonian Institution was asked to make a similar nomination, and selected Mr. Wilfred H. Osgood, of the Field Museum of Natural History, Chicago. For a nomination of a third person, the President of the United States invoked the National Academy of Sciences, which submitted the name of Prof. George H. Parker, of Harvard University. These gentlemen were duly appointed special assistants of the Department, were given individual and joint instructions, and were sent to the seal islands on a revenue cutter sailing from Seattle early in June, 1914. It was planned to have these specialists remain on the grounds until the latter part of August, so that they might become personally familiar with the fur seals during all critical stages of their land life.

Shortly before the departure of these assistants the Department was advised that the British and Japanese Governments desired to send experts to the seal islands to observe the condition of the herd, and steps were at once taken to provide transportation and other facilities. The two representatives of Great Britain were cared for on the vessel that carried the American agents, and the Japanese expert, arriving in Seattle early in July, was taken to Unalaska in a regular passenger steamer, and transferred thence to the seal islands in a revenue cutter.

Detailed reports are expected from the Department's agents at an early date. Meanwhile, it may be stated that they found the seal herd in excellent condition, having undergone a noteworthy increase since 1913. It was on the recommendation of these agents after they had studied the situation that the take of seals for the use of the natives was fixed at 4,500 for the season.

In the summer of 1914 the Department was apprised of the existence on the seal islands of social conditions highly prejudicial to the interests of the Government and natives. An investigation was at once ordered, and steps were immediately taken to correct the abuses, which are largely the result of administrative laxity of long standing.

Minor Fur-Bearing Animals of Alaska.

In the winter of 1912-13 the Government herds of blue foxes on the seal islands yielded 436 pelts, which were shipped to St. Louis and sold at public auction on the occasion of the fur-seal sale. The gross amount received therefor was \$17,552.

At the beginning of the fiscal year the Department was greatly embarrassed in its efforts to administer the law for the protection of the fur-bearing animals of Alaska by a defect in the appropriation act, consisting of a failure to make any provision for carrying on the work of the wardens. In a later deficiency act a certain sum was made available for this purpose, and the wardens continued actively in the field during the remainder of the fiscal year. A number of cases of violation of law were successfully prosecuted.

The recent noteworthy movement looking to the rearing of fur-bearing animals in captivity, which has been especially successful in the case of foxes, has led to numerous requests from Alaska for permission to take animals alive in the close seasons. Careful consideration was given the matter, and it was decided that the proper development of fur farming in Alaska demanded some modification of the close-time regulations. Accordingly, in the revised regulations issued under date of June 22, 1914 (Department Circular No. 246, second edition), provision was made for the taking of foxes, marten, mink, and land otter for breeding purposes during a part of the prescribed close time. In order that the Department may keep thoroughly informed regarding this new phase of the fur industry and prevent the abuse of the privilege of taking animals at a time when killing is prohibited, it is now required that all persons engaged in the business of rearing fur-bearing animals in Alaska shall first obtain a license; furthermore, a permit is required before such licensed fur farmers may ship their stock outside of Alaska.

Many permits affecting fur-bearing animals have been issued by the Department during the year, among them 31 permits to 16 persons and firms authorizing the shipment of 910 ranch-bred foxes.

The injurious effects of the eruption of Katmai on the animal life of the Afognak Reservation are well known. In view of the growing scarcity of foxes and land otters therein, it was deemed necessary to establish an absolute close time for a series of years. Accordingly, under date of October 29, 1913 (Department Circular No. 252), it was ordered that the pursuit, capture, or killing of foxes within the reservation should be prohibited until November 16, 1918, and of land otters until November 16, 1915.

Under the authority of law, the Department has offered for lease for fox-breeding purposes, for periods of five years, 12 islands

lying off the Alaskan coast. In response to a circular announcement issued in 1913, bids for two islands, at \$205 and \$200 per annum, were received and accepted. A second announcement, dated January 1, 1914, inviting proposals for leasing the remaining 10 islands, resulted in bids for 3 islands at \$200, \$205, and \$250 per annum, which will probably be approved. The offer of the Department to supply blue foxes for breeding purposes from the herds on the Pribilof Islands evoked a number of competitive bids, the highest being \$151 apiece for selected animals. Some deliveries have been made, but the plan presents a number of difficulties connected with the shipment and care of the foxes.

The present general law for the protection of fur-bearing animals in Alaska has proved quite inadequate in some respects. One serious defect is that its prohibitions apply only to the actual killing of animals, leaving the Department powerless to check operations of various kinds quite as detrimental as killing would be. The Department should have full and broad authority for regulating the capture of fur-bearing animals, so as to make hunting and trapping out of season illegal, to prevent the unlicensed destruction of burrows and the taking of young under circumstances that inevitably result in large mortality, and to permit the Government to adopt such other procedures as are generally recognized as necessary for the proper protection and conservation of the valuable fur resources of the Territory.

Custody over the terrestrial fur-bearing animals of Alaska, which is now imposed by law on the Bureau of Fisheries, is an uncongenial, incongruous duty entirely foreign to the proper functions of that Bureau. The legitimate activities of the Bureau require the undivided attention of the staff, and I therefore sympathize with the attitude of the Commissioner of Fisheries toward this matter and approve his recommendation for the transfer of this service to some other Government agency, preferably the Bureau of Biological Survey of the Department of Agriculture, which already has jurisdiction over certain of the animals of Alaska and is fully organized for administering all matters connected with the fur-bearing animals at large. The Department should continue to exercise control over all the fur-bearers whose pursuit constitutes a fishery; and, in addition thereto, it should have authority over the walrus, which at present comes under the jurisdiction of the Department of Agriculture.

Meanwhile, however, the Department is endeavoring to promote the fur industry of Alaska in every feasible way; and it favors the speedy enactment of legislation that will correct defects in existing law and will exemplify the Department's policy for the preservation of the wild stock (which must for a long time constitute an important means of livelihood to many people in Alaska) and for the building up of an additional fur industry through the domestication and cultivation of fur-bearing animals under private auspices.

Miscellaneous Matters.

The Aleutian Islands Reservation.—Under the Executive order of March 3, 1913, creating the Aleutian Islands Reservation, the Secretary of Agriculture and the Secretary of Commerce have issued joint regulations for the administration of the reservation, effective March 15, 1914. Under these regulations "all matters pertaining specifically to the fisheries and all aquatic life, and to the killing of fur-bearing animals, will be under the immediate jurisdiction of the Department of Commerce," while various other matters come under the joint jurisdiction of the two Departments.

Fishery matters in Congress.—Fishery legislation of unusual importance was considered at the second session of the Sixty-third Congress, and the Department was called on for reports on numerous measures and testimony before committees of the Senate and House.

A bill which marked a wide departure in Federal fishery legislation provided for national control over migratory fishes which do not pass their entire life within the jurisdiction of a given State. Extended hearings on the measure were given by the House Committee on the Merchant Marine and Fisheries, but no further action has yet been taken.

No legislation has as yet been enacted to give effect to the treaty of April 13, 1908, providing for joint international regulations governing the fisheries in the contiguous waters of the United States and Canada. As long ago as 1910, the Canadian Government adopted the regulations made under the treaty, but opposition developed in Congress, and the entire matter had lain dormant in the United States since 1911. In 1913 a new international fisheries commissioner on behalf of the United States was appointed, and the matter was reopened with a view to securing some action by Congress which would permit the Federal Government to en-

force a system of protection for the food and game fishes in the waters of our northern boundary. The Senate passed the necessary bill in March, 1914, and the Committee on Foreign Affairs of the House, after a number of hearings, made a favorable report, but final action has been delayed.

In the act making appropriations for the fiscal year 1915, the following limitation is placed on the sum provided for the propagation of food fishes:

No part of the foregoing amount shall be expended for hatching or planting fish or eggs in any State in which, in the judgment of the Secretary of Commerce, there are not adequate laws for the protection of the fishes, nor in any State in which the United States Commissioner of Fisheries and his duly authorized agents are not accorded full and free right to conduct fish-cultural operations, and all fishing and other operations necessary therefor, in such manner and at such times as is considered necessary and proper by the said commissioner or his agents.

This important legislation, which is heartily approved by the Department, will necessarily conduce to increased efficiency of the fish-cultural operations and should lead to much needed cooperative efforts on the part of the States.

Cooperation with other departments.—In connection with investigations carried on by the *Fish Hawk* in Chesapeake Bay and tributaries in the winter and spring of 1913-14, facilities were furnished to the Department of Agriculture for making a sanitary examination of the oyster beds.

Arrangements have been made with the Department of the Interior and the Department of Agriculture whereby the Bureau will hereafter systematically supply desirable fishes for stocking the waters of national parks and forestry reservations. The work will be conducted on a large scale and will cover a definite period of years, in the expectation that the attractiveness of the parks and reservations to the general public may be increased by the fishing facilities.

A large number of samples of foreign and domestic fishery products have been submitted to the Bureau by the Bureau of Chemistry of the Department of Agriculture. These have been examined and identified, and reports thereon prepared with reference to the application of the food and drugs act.

Pacific coast branch.—In order to maintain more intimate relations with the important fishery interests on the Pacific coast with which the Bureau has to deal, a branch office was established in Seattle near the close of the fiscal year. This will be the headquarters for the fishery, fish-cultural, and other branches of the work; and should result in increased efficiency and economy,

more particularly in the matter of the purchase of supplies for the Alaska service and for the numerous hatching stations in the Northwest. It is proposed to place the office in charge of an experienced assistant, and to make it a center for the collection and dissemination of information regarding all fishery matters pertinent to or of practical interest to the Pacific States and Alaska.

Maine lobster conference.—In view of the importance of the lobster industry of Maine and the activities of the Bureau in relation thereto, a conference was held in January, 1914, at the office of the Commissioner of Fisheries for the purpose of announcing the attitude of the Department toward certain features of the work and of learning the views of the State fish commissioner, lobster fishermen, and lobster dealers, all of whom were represented at the conference. The governor of Maine and the State delegation in Congress were also present. The proposed new policy of the Department, under which the expenditures for lobster culture will be more direct and effective, was unanimously approved.

Pollution of waters.—The Bureau is not provided with the necessary means of performing its duties with respect to the pollution of lakes and streams. It has, however, made what effort it could, and in cooperation with the Illinois Natural History Survey contributed to the study of the discharge from the Chicago Drainage Canal. This investigation, the results of which were published by the State of Illinois during the past year, yielded data of great importance and of application to other streams carrying large quantities of domestic and municipal sewage.

Complaints that oil refineries and tank steamers were polluting the Delaware River to the detriment of the fisheries were investigated, and some ill effects were apparently to be found, but the season was not advantageous for accurate determination. The presence of the oil was thought to affect the salability of the fish rather than their movements and distribution.

The discharges from the Government powder factory at Indian-head, Md., upon investigation were found to be toxic, and the Secretary of the Navy, upon request, took measures to remedy conditions complained of, although no positive injury to fish was disclosed.

Utilization of neglected aquatic products.—Continuing its efforts to establish a market for certain very wholesome but now unutilized products, the Bureau has conducted a special publicity

campaign in behalf of the sea mussel. Through the press and otherwise, it was possible within a few months to establish this new sea food upon the menus of over 70 hotels, restaurants, and clubs of Boston, and retail dealers were induced to offer mussels for sale under placards bearing the Bureau's indorsement. There was also issued and widely distributed by the Bureau a circular, describing sea mussels, explaining their excellence and cheapness, and giving a number of tested recipes for cooking them. This propaganda was so successful in various Massachusetts cities and towns that the campaign will be extended to other parts of the country. Canned mussels are a highly satisfactory product available to the inland public.

Efforts to create a market for the dogfish have been of slow progress because of the prejudice against the fish, and success will apparently depend upon securing legislation enlarging the Bureau's authority.

Fish culture on the farm.—The Bureau believes that in sections of our country an acre of water can be made as productive of food values for the farmer as an acre of land. With this in view it is encouraging farmers to use small ponds that may exist upon their land or to create such ponds. The Bureau will stock them with food fishes suitable for the locality, providing these without expense and instructing the farmer in their care. In this way an additional food supply is being provided in many portions of the country.

Alaska inspection.—In the spring of 1914 Dr. E. Lester Jones, Deputy Commissioner of Fisheries, was instructed to proceed to Alaska and make an inspection in that great territory of the conditions affecting the work of the Bureau. From this trip he has but just returned and his report had not been received when this was written. It is known, however, that a mass of information has been collected and many photographs have been taken which will throw a flood of light upon Alaskan conditions.

Dr. Jones was fortunately near at hand when conditions arose upon the Pribilof Islands requiring immediate investigation. He took charge of that inquiry and conducted it with care and promptness to a satisfactory conclusion, which has resulted in marked improvement in official and social relations upon the islands. The Department, however, believes that it is essential for the security of the Government property and the maintenance of order and law upon the islands that there should be an officer of

more authority than has heretofore been available. A request will therefore be made to Congress for authority and an appropriation for a superintendent of the islands who can be directly responsible for all the conditions there. In view of the fact that there is Government property to the potential value of many millions on these islands, together with a community of some hundreds of souls, the necessity for such an officer would seem justified by theory, and experience has also shown that the need exists.

Urgent need for fish pathologist.—The Department has repeatedly requested from Congress authority to appoint a fish pathologist on the staff of the Bureau, and this request, though approved by the Senate, has always been rejected by the House of Representatives. It is difficult to understand why this should be refused. The Government does not hesitate to provide inspectors for meat, and the States provide for inspection of milk. Evidence has been placed before Congress indicating that diseased fishes may cause disease in human beings, and that in some cases there is a common cause of disease in human beings and fishes; and evidence is available showing also that diseases in human beings are transmitted through water to fishes, making them unfit for food. Yet an appropriation of \$2,500 to give this subject scientific thought is continuously denied. If this be on the ground of economy, it can only be justified on the theory that dollars are worth more than lives, which I imagine the people would hardly approve should the facts be brought home to them.

The Department takes this occasion to say that a pathologist for studying the diseases of fishes is an urgent necessity in the interest of the fish-cultural work and of the public, and that since the Department is not permitted to make this inquiry it must not be held accountable for large avoidable losses of valuable fish or for diseases that occur through unknown causes arising from fish life.

BUREAU OF LIGHTHOUSES.

The reorganization of the Lighthouse Service under the provisions of the act of Congress approved June 17, 1910, was entirely completed during the early part of the fiscal year 1913, and continued to operate satisfactorily during the fiscal year 1914. All of the lighthouse districts, with the exception of the three river districts, are now in charge of civilian inspectors. It is believed that the efficiency of the Service has been increased by the reorganization and that the work is more economically performed, especial attention being invited to the fact that up to July 1, 1914, there has been an increase of 2,485, or more than 21 per cent, in the number of aids maintained over the corresponding number on July 1, 1910, while the total general appropriations for the support of the Service for the fiscal year 1915 are about \$320,000 less than those for the fiscal year 1911.

The general organization of the Lighthouse Service remains the same as described in the annual report for 1913.

On June 30, 1914, there were 5,562 persons employed in the Lighthouse Service, including 93 in the technical force, 143 in the clerical and office force, and 5,326 connected with depots, light-houses, and vessels.

Administrative Methods and Economies.

A conference of lighthouse inspectors, authorized by me, was held for the first time in the history of the Service during February, 1914. A detailed synopsis of subjects for discussion, under the general heads of aids to navigation, administrative methods, construction work, apparatus and equipment, vessels, and similar topics was prepared and distributed in advance. The proceedings were entirely informal, and general minutes embodying the results of the discussion were subsequently sent to the various inspectors. A visit to the general depot closed the conference. The results are believed to be of great value in effecting a closer degree of cooperation and efficiency, as well as affording inspectors an opportunity for interchange of ideas and methods.

Systematic inspections were continued during the fiscal year in the various lighthouse districts by the general inspector, examiner,

and officers of the Bureau. The increasing value of this work in maintaining the Service at a high standard is shown in the results accomplished.

Revised instructions relative to making requisitions for office furniture, equipment, and supplies, in conformity with a revised manual issued by the Department on the subject, were issued during the year.

A general examination was made of library books furnished isolated stations and vessels, and instructions were issued for general improvement of them, including books for children where desirable.

An inquiry was made in reference to educational conditions for children of lighthouse keepers at such stations as are not readily accessible to ordinary school facilities, and arrangements made for systematic transfer of such keepers and consultation with local educational authorities when practicable.

A standard method of handling requests of lighthouse keepers for transfers was outlined, in order to insure equitable treatment of such employees and uniformity in the matter.

Permission was obtained from the Civil Service Commission for transferring keepers or employees from trades or mechanical positions to that of watchman in the Lighthouse Service under suitable restrictions as to eligibility.

New regulations governing the payment of medical and surgical, also of burial, expenses for nonstatutory employees were put into effect during the fiscal year. These provide for a maximum payment of \$100 for each object, under proper safeguards and restrictions.

Commutation of subsistence on lighthouse vessels, authorized by the act of August 24, 1912, and inaugurated last year, was gradually extended during the fiscal year, and at the close thereof all lighthouse vessels, including light vessels and tenders, were operated under this system with excellent results. In order to provide against any possible shortage in food supplies, reserve provisions consisting of meat and pilot bread in tins were prescribed for isolated vessels and stations in quantities suitable for the various complements and localities, and instructions issued for the proper consumption of such provisions in rotation; also for their replenishment and inspection at stated intervals.

Revised instructions governing the sale of condemned property, in accordance with the act of March 4, 1913, were issued. These

provide for sales under sealed bids, where desirable, and for more prompt forwarding of the gross receipts and for the payment of expenses of the sale from such receipts by the disbursing clerk of the Department.

Tentative arrangements were made for the exhibit of the Lighthouse Service at the Panama-Pacific International Exposition, to be held in San Francisco in 1915. Estimates of expense and lists of articles to be exhibited were prepared, and an allotment of \$4,750 was granted by the governing board from the appropriation made for the Government's exhibit. An examination of records was made to ascertain the nature and number of lighthouse articles of historical interest which might be of value to the exhibit.

The order of the Postmaster General increasing the limits of weight for mail matter transmitted by parcel post within certain zones to a maximum of 50 pounds was put into effect in the Lighthouse Service and has proven advantageous in shipping many small articles of supply.

With a view to avoiding any delay in the business of the Service, a form showing the nature and mailing dates of various routine reports required was prepared and distributed, and in the accomplishment of the same purpose a standard form of follow-up letter to be used in case of delayed replies was also devised.

The publication of the monthly Lighthouse Service Bulletin, describing the principal events in the Service of interest and importance to officers and employees, was continued throughout the year. The publication of this bulletin was commenced in January, 1912.

The study of the most useful size and arrangement of light and buoy lists was continued, and consideration given to efficient and ready methods of keeping copy for the printer corrected to date, in order to prevent delays in publication. Toward the close of the fiscal year arrangements were made for printing buoy lists in octavo size, which it is believed will extend the usefulness of the publications by providing the information in a more compact form and at lessened cost.

A new edition of the regulations, embodying all changes and amendments made in the former edition of 1911, was issued on October 1, 1914.

A standard method of cost keeping has been continued in effect throughout the fiscal year, and reports have been received from

all the districts, in which itemized costs of each office, depot, light and fog-signal station, tender, and light vessel are shown separately. Beneficial effects of this systematic method of keeping costs have been shown by a gradual reduction in the cost of maintenance of a number of classes of aids to navigation as compared with figures for previous years.

There has been increasing difficulty in obtaining competent seamen and other members of crews for lighthouse vessels in recent years, and as a result lighthouse tenders engaged in important buoy work have not been able, in some cases, to maintain a full crew, or have had their crews made up largely of inexperienced men. A table showing the authorized complements of seamen, firemen, and mess attendants on board lighthouse tenders, with the number of changes that have taken place in such positions during the fiscal years 1913 and 1914, is appended, which indicates clearly the difficulties encountered in attempting to do the work of the Lighthouse Service under the present scale of wages for these persons.

APPROXIMATE NUMBER OF CHANGES OCCURRING AMONG AUTHORIZED COMPLEMENTS OF SEAMEN, FIREMEN, AND MESS MEN ON LIGHTHOUSE TENDERS DURING THE FISCAL YEARS 1913 AND 1914.

| District. | Tender. | Seamen. | | | Firemen. | | | Mess men. | | |
|-----------|-----------------------------|------------------------|----------|------|------------------------|----------|------|------------------------|----------|------|
| | | Authorized complement. | Changes. | | Authorized complement. | Changes. | | Authorized complement. | Changes. | |
| | | | 1913 | 1914 | | 1913 | 1914 | | 1913 | 1914 |
| 1st..... | Hibiscus..... | 7 | 27 | 22 | 6 | 23 | 12 | 4 | 5 | 3 |
| | Zizania..... | 6 | 8 | 0 | 4 | 17 | 22 | 4 | 1 | 4 |
| 2d..... | Anemone..... | 7 | 17 | 19 | 6 | 23 | 23 | 4 | 5 | 4 |
| | Azalea..... | 6 | 9 | 9 | 4 | 8 | 1 | 4 | 3 | 1 |
| | Mayflower..... | 6 | 44 | 18 | 6 | 10 | 10 | 4 | 5 | 8 |
| 3d..... | Daisy..... | 2 | 3 | 2 | 1 | 1 | 0 | 1 | 2 | 4 |
| | Gardenia..... | 6 | 21 | 42 | 2 | 5 | 11 | 3 | 5 | 13 |
| | John Rodgers..... | 6 | 21 | 14 | 4 | 7 | 9 | 4 | 4 | 1 |
| | Larkspur..... | 6 | 14 | 19 | 6 | 10 | 5 | 4 | 6 | 16 |
| | Mistletoe..... | 6 | 18 | 48 | 4 | 4 | 6 | 4 | 7 | 13 |
| | Pansy..... | 6 | 7 | 8 | 4 | 3 | 4 | 4 | 5 | 16 |
| | Tulip..... | 8 | 25 | 11 | 6 | 33 | 13 | 4 | 13 | 21 |
| 4th..... | Iris..... | 6 | 35 | 25 | 4 | 8 | 6 | 4 | 2 | 1 |
| 5th..... | Holly..... | 6 | 5 | 6 | 4 | 5 | 5 | 4 | 1 | 2 |
| | Ivy..... | 6 | 5 | 23 | 6 | 7 | 13 | 4 | 4 | 9 |
| | Jessamine..... | 6 | 11 | 10 | 4 | 5 | 4 | 4 | 5 | 0 |
| | Juniper..... | 2 | 1 | 3 | 2 | 0 | 6 | 1 | 1 | 0 |
| | Maple..... | 6 | 6 | 19 | 6 | 15 | 27 | 4 | 0 | 4 |
| | Orchid..... | 7 | 16 | 14 | 6 | 33 | 17 | 4 | 8 | 22 |
| | Woodbine ^a | 2 | | 3 | | | | 1 | | 1 |

^a Not in commission during fiscal year 1913.

APPROXIMATE NUMBER OF CHANGES OCCURRING AMONG AUTHORIZED COMPLEMENTS OF SEAMEN, FIREMEN, AND MESS MEN ON LIGHTHOUSE TENDERS DURING THE FISCAL YEARS 1913 AND 1914—Continued.

| District. | Tender. | Seamen. | | | Firemen. | | | Mess men. | | |
|----------------|-----------------|------------------------|----------|------|------------------------|----------|------|------------------------|----------|------|
| | | Authorized complement. | Changes. | | Authorized complement. | Changes. | | Authorized complement. | Changes. | |
| | | | 1913 | 1914 | | 1913 | 1914 | | 1913 | 1914 |
| 6th..... | Arbutus..... | 6 | 16 | 28 | 4 | 25 | 17 | 4 | 8 | 4 |
| | Cypress..... | 7 | 30 | 29 | 6 | 12 | 21 | 4 | 4 | 0 |
| | Mangrove..... | 6 | 20 | 27 | 6 | 9 | 6 | 4 | 6 | 9 |
| | Snowdrop..... | 1 | 1 | 0 | | | | 1 | 0 | 0 |
| | Water Lily..... | 1 | 1 | 2 | | | | 1 | 0 | 0 |
| 7th..... | Magnolia..... | 6 | 38 | 16 | 6 | 52 | 14 | 4 | 6 | 1 |
| 8th..... | Camellia..... | 4 | 24 | 51 | 3 | 5 | 16 | 3 | 13 | 9 |
| | Lilac..... | 6 | 11 | 41 | 6 | 11 | 25 | 4 | 10 | 10 |
| | Sunflower..... | 6 | 17 | 15 | 6 | 7 | 11 | 4 | 8 | 5 |
| 9th..... | Myrtle a..... | 6 | | 11 | 4 | | 5 | 4 | | 0 |
| 10th..... | Crocus..... | b 5½ | 32 | 31 | b 5½ | 45 | 48 | b 3½ | 7 | 8 |
| 11th..... | Amaranth..... | b 5½ | 40 | 15 | b 3½ | 12 | 15 | b 3½ | 6 | 7 |
| | Aspen..... | b 3½ | 18 | 17 | 2 | 4 | 11 | 2 | 7 | 13 |
| | Clover a..... | b 3½ | | 11 | b 1½ | | 13 | 2 | | 8 |
| | Marigold..... | b 5½ | 34 | 33 | b 3½ | 22 | 22 | b 3½ | 14 | 6 |
| 12th..... | Hyacinth..... | b 5½ | 11 | 23 | b 3½ | 12 | 22 | b 3½ | 1 | 5 |
| | Sumac..... | b 5½ | 5 | 7 | b 5½ | 13 | 12 | b 3½ | 3 | 14 |
| 13th and 14th. | Goldenrod..... | 6 | 15 | 6 | 2 | 3 | 2 | 4 | 34 | 15 |
| 15th..... | Oleander..... | 6 | 18 | 12 | 3 | 10 | 6 | 4 | 15 | 9 |
| 16th..... | Columbine..... | 7 | 52 | 19 | 6 | 3 | 6 | 4 | 20 | 27 |
| 17th..... | Heather..... | 7 | 16 | 20 | 6 | 11 | 17 | 4 | 6 | 3 |
| | Manzanita..... | 7 | 22 | 19 | 6 | 24 | 26 | 4 | 17 | 9 |
| 18th..... | Madrone..... | 7 | 11 | 13 | 6 | 16 | 6 | 4 | 13 | 21 |
| | Sequoia..... | 7 | 46 | 17 | 6 | 27 | 13 | 4 | 19 | 17 |
| 19th..... | Kukui..... | 6 | 14 | 8 | 6 | 14 | 10 | 4 | 7 | 3 |
| | Total..... | 249½ | 785 | 786 | 192½ | 554 | 538 | 157½ | 306 | 336 |

a Not in commission during fiscal year 1913.

b Fractions result from members of crew being authorized for portion of year only.

Cooperation.

Special effort has been continued to consult the needs of maritime interests as to aids to navigation and to cooperate with other branches of the Government having interest in or relations with the work of this Service.

Cooperation with the United States Engineer officers in charge of river improvements in the river districts has been continued with entire success.

Cooperation with the Navy Department was extended by the promulgation of joint regulations dated January 20, 1914, gov-

erning repairs to vessels and obtaining of marine stores at navy yards and naval stations.

The facilities of Navy Department radio stations for the transmission of official radiograms, both from shore and vessel stations, were extended to the Lighthouse Service.

Arrangements were made with the Treasury Department for the detail of officers of the Public Health Service, when available, for inspection of the sanitary conditions and general health of employees at isolated stations and on vessels.

Joint regulations covering the lighting of fish pounds, to be included in permits which may be granted by the War Department for the erection of fishing structures and appliances, were issued during the year.

Arrangements were made to cooperate with the Department of Agriculture in enforcing the regulations for the protection of migratory birds approved by the President on October 1, 1913, by furnishing copies of such regulations to keepers and other employees and directing them to report violations promptly.

Instructions were issued to furnish the Department of Labor, at stated intervals, data regarding subcontracts on contract works of construction and repair in force in the Lighthouse Service.

Instructions cooperating with the Treasury Department for standard sizes and rules regarding towels used in public buildings were issued.

Arrangements were made for the recovery of valuable buoys adrift on the high seas by cooperation between the radio stations of the Navy Department and revenue cutters of the Treasury Department cruising in the vicinity of such drifting buoys.

Arrangements were made for cooperation with the Revenue-Cutter Service, Treasury Department, whereby wrecks discovered by that service on the Florida Reefs will be promptly reported to the proper lighthouse inspector, to permit issuing a notice to mariners in order that vessels navigating in the vicinity may not be misled as to their own positions.

Cooperation with the Bureau of Navigation, Department of Commerce, was also arranged, whereby vessels of that Bureau will notify the nearest lighthouse inspector, by radio when practicable, of any defects observed in aids to navigation.

Legislation Affecting the Lighthouse Service.

In addition to the maintenance appropriations for the current fiscal year, appropriations for the following special works have been made since the close of the year 1914:

| | |
|---|-----------|
| Carpenter shop for the general lighthouse depot, Tompkinsville, N. Y..... | \$23, 000 |
| Completion of Kilauea Point Light Station, Kauai Island, Hawaii..... | 3, 000 |
| Aids to navigation in Alaska..... | 60, 000 |
| Aids to navigation at the entrances to the Cape Cod Canal, Mass..... | 50, 000 |

Authority was granted by the act of March 9, 1914, for the leasing of an unused portion of the Ediz Hook Lighthouse Reservation, Wash., to the city of Port Angeles, Wash., for a period of 99 years, with suitable restrictions and safeguards.

The act of May 26, 1914, authorizing the Secretary of War to grant the use of the Fort McHenry Military Reservation, Md., to the city of Baltimore for park purposes, contained a clause excepting that portion in use by the Lighthouse Service, with the electric pole line leading thereto.

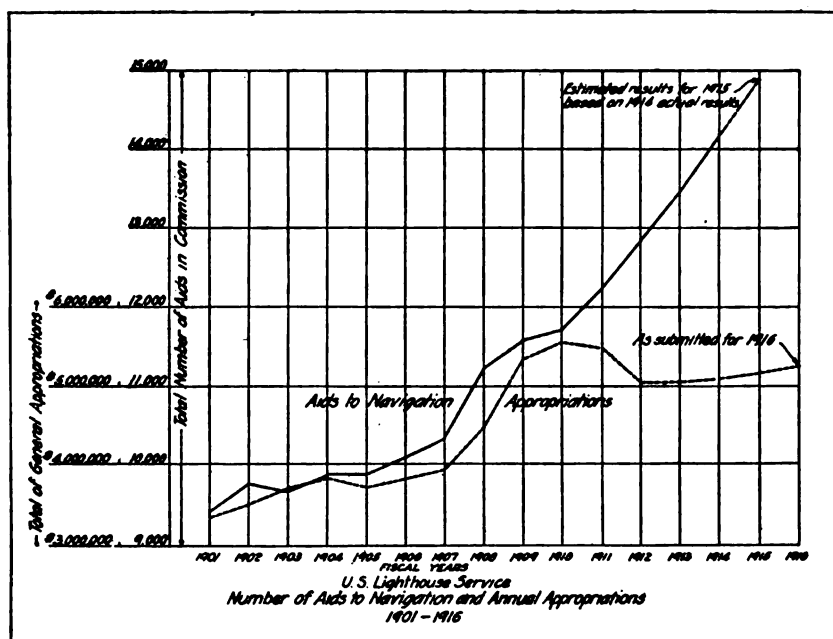
Appropriations.

The estimates for maintenance appropriations for the year 1915 were divided into one appropriation for general expenses of supplies, repairs, etc., and three appropriations for salaries, with a recommendation that consideration be given to the consolidation of all these appropriations into one. This alternative proposition, however, was not authorized by Congress. It is believed that with this form of appropriation a more economical and efficient administration of the Lighthouse Service could be effected, and in the estimates for the next fiscal year attention has been drawn to the fact that, if this consolidation is authorized, a reduction of \$25,000 on the total estimates may be safely made.

Besides the estimates for maintenance, estimates for 27 special works have been submitted, aggregating \$1,493,500. These include—

- 2 new lighthouse tenders.
- 7 new light and fog-signal stations.
- 3 new light stations.
- 1 new lighthouse depot.
- 4 items for establishing or improving aids in general localities.
- 1 item for a new system of harbor or channel lights and other aids.
- 5 items for improvements of light or fog-signal stations or of groups of aids to navigation.
- 3 items for improvement of lighthouse depots.
- 1 item for light keepers' dwellings.

Special attention is invited to the fact that the appropriations for special works in the Lighthouse Service for the fiscal year 1915 total only \$136,000, while the average amount for the 10 preceding fiscal years was \$946,927 annually. Practically all of the items submitted are the same as those submitted last year, on which action has not yet been taken by Congress. These items are all considered meritorious and urgent for the safety of shipping, and have been requested many times by navigators and maritime interests. In view of the increasing growth of the commerce of the country and the efforts now being made to extend it further,



it is believed that these appropriations should be made at the next session of Congress.

Aids to Navigation.

During the fiscal year ended June 30, 1914, there was a net increase of 677 in the total number of aids to navigation maintained by the Lighthouse Service, including 59 lights above the order of minor lights, 1 fog signal, 2 submarine bells, 270 day marks, 65 lighted buoys, 157 unlighted buoys, and 88 minor lights.

Fixed lights were changed to flashing or occulting at 67 stations. The illuminant of 37 lights was changed to incandescent oil vapor,

the illuminant of 25 lights was changed to acetylene, and the illuminant of 48 lights was changed to oil gas.

On June 30, 1914, there were maintained by the Lighthouse Service 14,198 aids to navigation, including 5,004 lights of all classes, and 567 fog signals, of which 48 are submarine signals. It is believed that the systematic methods of improvement and the use of modern apparatus in increasing the number and brilliancy of aids have been of value to the safety of commerce. Particular attention is invited to the fact that incandescent oil vapor is now used as the illuminant of 268 lights, embracing practically all the principal seacoast lights in the Service.

The following are some of the more important aids which have been established or materially improved during the past fiscal year:

Complete new and improved systems of lighted aids were established in Baltimore Harbor, Md., North Channel, Boston Harbor, Mass., and St. Marys River, Mich.

First-order lights changed to flashing or occulting: Cape Blanco, Oreg.; Cape Lookout, N. C.; Shinnecock Bay, N. Y.; North Head, Wash.; Cape Flattery, Wash.

Special improvements at Capes Hatteras and Lookout, N. C., included an increase in intensity and speeding up of the lens at Cape Hatteras, and the introduction of a three-mantle oil-vapor lamp with occulting screens to produce a more effective characteristic at Cape Lookout.

Horn fog signal established: Whatcom Waterway, Wash.

Fog bells established: Aunt Phoebe Rock, N. Y.; Fiddlers Reach, Me.; Sandy Point Breakwater, Conn.

Submarine bells added to existing gas and whistling buoys: Point Judith, R. I.; Manana Island, Me.; St. Johns Entrance, Fla.

Important gas buoys established: McCries Shoal, N. J. (whistle); Little Gull Bank, Md. (whistle); Cape Romain, S. C. (whistle); Charleston, S. C. (bell); Biscayne Shoal, Fla. (bell); Point Delgada, Cal. (whistle); Duxbury Reef, Cal. (whistle); Joe Flogger Shoal, Del. (bell); Blackfish Bank, Va. (whistle); Boulder Reef, Mich. (whistle); Molasses Reef, Fla.; Cortes Bank, Cal. (whistle); Cape San Blas, Fla. (bell); Point Partridge, Wash. (bell); Port Harford, Cal. (whistle); Port Inglis, Fla. (whistle).

Systems of minor aids and buoyage extensively rearranged or improved in important localities: Kennebec River, Me.; Cohasset

Harbor, Mass.; New Bedford Harbor, Mass.; Providence River, R. I.; Lake Champlain, N. Y. and Vt.; Elizabeth River, Va.; inland waterway, S. C., Ga., and Fla.; Charleston Harbor, S. C.; Savannah River, Ga.; St. Simon Sound, Ga.; Charlotte Harbor, Fla.; Anclote River, Fla.; Sturgeon Bay, Wis.; Prince of Wales Island, Alaska; Kuhio Bay, Hawaii.

Flashing gas lights established: Acetylene—Caines Head, Windy Bay, Pilot Rock, Woody Island, Point Elrington, Smith Island, Cape Spencer, Cape St. Elias, and Point Ellis, Alaska; Sandy Point Breakwater, Conn.; Great Kills, N. Y.; Newark Bay, N. Y. and N. J. (4 lights); Fishing Point, Va.; Fort McHenry, Md.; Cape Fear River, N. C. (2 lights); Eastern Triangle, Fla.; Galveston Bay, Tex.; Ludington North Breakwater, Mich.; Kewaunee, Wis.; Port Wing, Wis.; Redding Rock, Cal. Oil gas—Recors Point, Mich.; St. Marys River, Mich. (45 lights).

The fiscal year was marked by an unusual amount of storm damage, the greatest loss occurring in the extremely severe storm of November 8, 9, and 10, 1913, on the Lakes, during which light vessel *No. 82*, on station in Lake Erie about 13 miles southwest of Buffalo, N. Y., was lost with her entire crew of six men. This is the second instance in the history of the Lighthouse Service in which a light vessel has foundered on station, the previous occurrence being on August 23–24, 1893, when light vessel *No. 37* was lost on Five-Fathom Bank, N. J., with four out of six men on board. Search was immediately instituted for light vessel *No. 82*, but the almost continuous heavy weather which prevailed from the date of the storm to the close of navigation in December prevented favorable results. In the meantime sufficient wreckage, including both small boats, doors, portion of vessel's rail, etc., drifted ashore as to preclude any hope for the safety of the crew. The search was resumed with the cooperation of the United States Lake Survey, using a wire drag, as soon as weather and ice conditions permitted in the spring, and on May 9, 1914, the wreck was located about 2 miles northeast of her station in 63 feet of water. The hull was found apparently intact, though the interior appeared badly damaged. No bodies were found. Bids were invited for raising the vessel and delivering her afloat in Buffalo Harbor, and a contract was let as soon as practicable. The work was in progress at the close of the fiscal year.

In addition to the loss of the vessel, valued at \$50,000, damage amounting to about \$15,000 was done to various light stations and vessels in the Lake districts by the same storm.

Other noteworthy storms were the hurricane of September 2 and 3, 1913, in the North Carolina Sounds, which destroyed about 20 post lights and damaged other lighthouse property at a total loss of about \$6,000, and the storm of November 29, 1913, on the north Pacific coast, which damaged lighthouse property to the extent of about \$11,000. No lives of persons in the Light-house Service were lost in either of these storms.

In accordance with the plan outlined in the annual report for 1913 for distinguishing light vessel stations, international code-signal letters have been assigned to the various stations.

A further improvement in the standard form of Notices to Mariners was effected by printing, in the back of each weekly notice, a list of corrections affecting the light lists, arranged in the tabular form of the lists, for greater convenience in correcting the lists by clipping and pasting.

Amendments to the Regulations for Lighting Bridges were approved by the Secretary on April 29, 1914, and steps were taken at the close of the fiscal year for the printing of revised regulations embodying such amendments, which have the effect of making the regulations more flexible, conforming to new conditions which have arisen.

To insure more complete uniformity in the buoyage of the Service, arrangements were made for reporting spare gas buoys at regular intervals, as well as statistics showing the number, locality, and reasons in the cases of buoys not relieved each year. Instructions regarding the painting of striped buoys were also under consideration at the close of the fiscal year.

Alaska.

The total number of aids to navigation in Alaska, including lights, fog signals, buoys, and day marks, in commission at the close of the fiscal year ended June 30, 1914, was 319, including 108 lights, representing an increase of 71 lights since June 30, 1910, or nearly 200 per cent. The table following, which gives the total number of aids to navigation on June 30 of each year named, illustrates the progress in establishing aids in the Territory.

| Aids. | 1910 | 1911 | 1912 | 1913 | 1914 |
|------------------|------|------|------|------|------|
| Lights..... | 37 | 71 | 85 | 93 | 108 |
| Fog signals..... | 9 | 10 | 10 | 10 | 10 |
| Buoys..... | 84 | 105 | 132 | 136 | 157 |
| Day marks..... | 30 | 29 | 38 | 40 | 44 |
| Total..... | 160 | 215 | 265 | 279 | 319 |

The act of October 22, 1913, made an appropriation of \$115,000 for a light and fog-signal station at or near Cape St. Elias. On account of the late date in the season, no work was practicable until the season of 1914. A temporary light was established at Cape St. Elias on June 18, 1914, and preliminary survey made for the permanent station.

The act of August 1, 1914, appropriated \$60,000 for the establishment of aids to navigation and the improvement of existing aids in Alaska, and in order to take advantage of the comparatively short season, a study was made, prior to the passage of the bill, for the best utilization of these funds for additional aids in Alaska, so that within a few weeks after the act was approved it was possible to make arrangements for the establishment of 19 new aids which are all greatly needed.

The paramount need of the Lighthouse Service in Alaska is the estimate for an appropriation of \$250,000 for a new tender to replace the *Armeria*. This item appears as No. 1 in the Department's estimates for the fiscal year 1916. The *Armeria* was wrecked on May 20, 1912, by striking a submerged, uncharted pinnacle rock having but 15 feet of water over it. This rock was subsequently located with difficulty and found to be very steep on all sides, the depth dropping quickly to 5 and 6 fathoms, and it was estimated that the summit was about 3 feet square. There is in the Lighthouse Service no tender permanently assigned to Alaska. The *Columbine*, which is now serving there, was borrowed from another district and is needed where she belongs. Furthermore, she is not large enough to do the Alaska work adequately or to be entirely safe for the long voyages and unfavorable weather conditions. In connection with the establishment of the light and fog signal at Cape St. Elias, for which an appropriation was made by the act of October 22, 1913, a large lighted buoy is needed to mark the very dangerous southeast rock. A buoy suitable for this service weighs nearly 14 tons, and the maximum

lifting capacity of the tender *Columbine* is less than 7 tons, so that the establishment of this much needed aid must be postponed until a vessel of sufficient size to do the work efficiently is provided. The request for authority to enlarge the proposed new tender to a vessel costing \$325,000 as compared with \$250,000 was made for the following reasons: The Government is charged with the responsibility of providing supplies for the natives and other inhabitants of the Pribilof Islands. These supplies include over 500 tons of coal annually and a thousand tons of hay, grain, lumber, and all other stores and merchandise needed for the support of a community of some hundreds of souls.

The transporting of sealskins is also a matter which could be accomplished on the return trip of the vessel. Even with the present closed season enough seal and fox skins are obtained to make a value during the past year of \$72,000. In four years the hire of private steamers cost over \$83,000 for this work, which might be all done by the proposed new tender at a trifling cost by being made a normal part of her outward and inward trips.

It should also be borne in mind that the distances in Alaska are great. From Ketchikan to Unalaska along the coast is 1,400 miles; to Bristol Bay and the Yukon district is still farther. A vessel is needed of sufficient size, not only to keep the sea in rough weather and do her work, but also to have a coal supply sufficient to avoid making duplicate trips back and forth, and also to enable her to carry supplies sufficient for the entire coast, when it shall be fully lighted, without having to return and take a second cargo for lack of carrying capacity. It is also believed that the proposed vessel fitted with modern oil-burning engines would cruise under ordinary conditions at reduced speed with little additional operating cost over the vessel originally authorized. If a smaller vessel is furnished, with less fuel and cargo capacity, it is apparent that there would be an early need for a second ship in order to cover the district of Alaska, in which the coast line requiring protection is greater in length than the entire Atlantic and Pacific shores of the continental United States.

Engineering and Construction.

New works of principal importance under special appropriations completed during the fiscal year are as follows: Storehouse for oil, Woods Hole Lighthouse Depot, Mass.; Newark Bay lights, N. J.; Negro Point Light and Fog Signal, N. Y.; Buffalo

Breakwater, North End Light and Fog-Signal Station, N. Y.; Sand Island Light Station, Ala., protection by riprap; San Juan Depot, P. R., improvements; St. Marys River, Mich., lights; 38 isolated oil houses at light stations, and a dwelling for the keeper at Kauhola Point Light Station, Hawaii, were also completed.

Other important work in progress at the close of the fiscal year includes Rondout, N. Y., light and fog signal; Miah Maull Shoal, N. J., light and fog signal; Brandywine Shoal, Del., light and fog signal; Thimble Shoal, Va., light and fog signal; Atchafalaya Entrance Channel, La., aids to navigation; Galveston Jetty, Tex., light station; Navassa Island, West Indies, light station; Ashtabula, Lorain, and Cleveland, Ohio, light stations; Ashland, Wis., light and fog signal; Manistique, Mich., light and fog signal, and Cape St. Elias, Alaska, light and fog signal.

In continuation of the work of developing standard plans and specifications for minor structures, designs were completed for iron substructures on four, seven, and nine reinforced concrete piles, with specifications covering their construction and erection.

A new type of portable acetylene tank house has been built for use on pile dolphins where there is danger of the dolphin being damaged by collision or carried away by the ice. These houses are so constructed that they may be readily removed, with all gas apparatus, and are furnished with a float on a length of light chain, to mark the locality for grappling in case the structure is swept away.

The use of concrete in beacon structures has been further extended with success. Concrete beacons previously built in place of old wooden cribs have stood heavy ice with success, and several more have been built during the past year. New concrete veranda roofs have been installed at light stations and have proven far superior to the sheet-steel construction formerly employed. In cases of destruction of tall wooden tripods by the sea, these have been replaced with strongly braced reinforced concrete structures.

Improvement of Apparatus and Equipment.

As a result of the tariff reductions effected by the act of October 3, 1913, a lower scale of prices was effected on various types of imported apparatus.

Careful attention was given at the general lighthouse depot, Tompkinsville, N. Y., to the manufacture and standardization of many articles, and substantial savings were effected in the cases of various parts heretofore purchased from manufacturers.

Improved post lanterns, both one-day and eight-day types, were made up and are being put into service. Drawings showing the design and detail price lists were also prepared. Special care has been given to the production of a wind-proof lantern, which has been tested for months through many severe gales without the light blowing out.

A new type of oil-engine torch, generating an intense heat and permitting the starting of internal-combustion kerosene engines in six minutes from the time of commencing to heat up the torch, was manufactured at an economical cost. This quick-starting feature is of value in the event of sudden fog.

An experimental installation was made of concentrated filament electric lamps in parabolic reflectors for range-light purposes. The apparatus is so arranged that it may be run either by commercial current or storage batteries, and in the event of the failure of one, the other is automatically cut into circuit; also in case of the failure of a lamp, a duplicate is automatically lighted.

In several other localities where a reliable supply of current is available the use of electric lighting has been extended. These are in general equipped either with automatic duplicating devices for substituting new bulbs on the failure of a filament, or relays which operate signal bells and lights in the keeper's quarters in case of any trouble. In some cases storage-battery auxiliaries have also been provided. New types of reflectors, made of glass with reflecting surface on the back, have also been placed in service.

Arrangements have been made for installing small plants at lighthouse depots for cleaning buoys, by means of oil engines, air compressors, with tank, piping, and air tools, as it has been shown by experience that this method is preferable to cleaning by hand, the work being done better, in less time, and with less injury to the metal.

An acetylene fog gun was imported and installed at a light station for service test toward the close of the fiscal year. Mariners have been requested to report their opinions as to the practical efficiency of the device.

Arrangements have been made for the experimental installation of temporary unwatched acetylene lights for winter use at certain isolated stations on the Great Lakes, which, if successful, will permit the keepers to leave such stations under safer conditions and yet give service to belated mariners after the close of the regular navigation season.

The use of thermostat alarms designed to call keepers when the light burns either too high or too low has been continued with success.

The use of a new type of compound quick-opening whistle valve for fog signals has been extended, resulting in improvement of the signal and saving of compressed air formerly lost by leakage in older types.

Vessels.

Contract was awarded on September 9, 1913, for the medium-draft lighthouse tender *Laurel*, for service in the fifth lighthouse district. The vessel was launched at Baltimore, Md., on June 24, 1914, and will probably be completed during the present fiscal year.

Contract was awarded on April 17, 1914, for the small tender *Fern*, for service in the inside waters of the sixteenth lighthouse district (Alaska). The contractors began the assembling of materials shortly after the close of the fiscal year.

The tender *Woodbine*, propelled by an internal-combustion kerosene engine, was placed in commission in the fifth lighthouse district on March 1, 1914.

The continuance of the plan of systematic docking, painting, and minor repairs to tenders during the year has resulted in higher efficiency and better maintenance.

The construction of new light vessels *No. 96* and *No. 98* at Muskegon, Mich., was well advanced during the year. These vessels will be used on the Great Lakes. *No. 96* was launched on April 21, 1914, and *No. 98* on June 9, 1914. It is expected that both will be completed during the current fiscal year.

Plans are in preparation for the construction of first-class light vessels *No. 99* and *No. 100* and second-class light vessel *No. 101*.

In connection with the design of new light vessels consideration has been given to making all parts of such vessels readily accessible for cleaning, painting, and overhauling, which it is believed will effect a considerable economy in future repairs of such vessels.

Saving of Life and Property.

During the fiscal year 1914 services in saving of life and property were rendered and acts of heroism performed by employees of the Lighthouse Service on vessels or at stations on 124 occasions, a list of which is appended.

**SAVING OF LIFE AND PROPERTY BY VESSELS OR EMPLOYEES OF THE LIGHTHOUSE
SERVICE DURING THE FISCAL YEAR 1914.**

| District. | Vessel or employee rendering service. | Vessel, etc., aided. | Nature of assistance. |
|-----------|--|--|---|
| 1st.... | Tender Hibiscus..... | Schooner Alice..... | Pulled vessel off rocks at Allens Ledge, Me. |
| | Jerome H. Peasley, keeper, Crabtree Ledge Light Station, Me. | Schooner-yacht White Wings. | Rendered assistance in getting yacht off rocks near station. |
| | Tender Zizania..... | Schooner Carrie May.. | Towed schooner which in fog had anchored in dangerous position near rocks. |
| | James Burke, keeper, Cape Neddick Light Station, Me. | Launch..... | Towed to Cape Neddick Light Station launch that had become disabled, taking care of occupants overnight. |
| | Mitchell Blackwood, keeper, and Chas. A. Radley, second assistant keeper, Boon Island Light Station, Me. | Power boat..... | Rescued 2 men from being driven to sea in disabled power boat and brought them to light station. |
| | Heber G. Sawyer, keeper, Bear Island Light Station, Me. | Motor boat..... | With personal power launch picked up and towed 1 mile disabled launch with man aboard. |
| | James Burke, keeper, Cape Neddick Light Station, Me. | Samuel L. Lewis..... | Burke went to rescue of Mr. Lewis, taking him from water, furnishing him with dry clothes, and caring for him. Mr. Lewis states owes life to Burke. |
| | Tender Hibiscus..... | Schooner Harriet C. Whitehead. | Assisted tug Betsey Ross in pulling schooner off rocks. |
| sd.... | Charles H. Jennings, keeper, Monomoy Light Station, Mass. | Power boat; owner, Theodore Drew. | Assisted in getting disabled boat to safe anchorage. |
| | Joseph B. McCabe, keeper, and C. B. Bassett, assistant keeper, Deer Island Light Station, Mass. | Steam launch from U. S. S. North Carolina. | Carried towline from tug to disabled launch. Party of men and women on board besides crew of 5 enlisted men. |
| | Shovelful Shoal Light Vessel No. 3, Mass. | Motor boat Chappaquiddick. | Four men taken off disabled boat and cared for on board light vessel overnight. |
| | John W. Davis, keeper, Annisquam Light Station, Mass. | Yacht Jack Tarr..... | Brought to shore 2 men from stranded vessel and furnished them dry clothing. |
| | Pollock Rip Shoals Light Vessel No. 73, Mass. | Power launch; owner, Leo H. Leary. | Picked up adrift. |
| | George E. Kezer, keeper, Lovells Island Lighthouse Depot. | Five fishing dories from schooner Olive F. Hutchins. | Schooner wrecked; recovered 5 boats adrift. |
| | Charles A. Baker, keeper, Butler Flats Light Station, Mass. | Motor boat; owner, Chas. E. Jones. | Saved boat from going to pieces on rocks; towed boat with 3 men aboard to wharf. |
| | Tender Mayflower..... | Tug Mary Arnold (owners, Ross Towboat Co.) and lighter R. G. No. 1 (owners, Rockport Granite Co.). | Vessels stranded; tender's launch towed lighter to anchorage and stood by tug until daylight; tender towed vessels to safe anchorage. |
| | Tender Anemone..... | Steamer Kiphias..... | Steamer grounded on Great Ledge, Woods Hole, Mass., lost her rudder, and was drifting with tide; towed to wharf by tender's launch. |

SAVING OF LIFE AND PROPERTY BY VESSELS OR EMPLOYEES OF THE LIGHTHOUSE SERVICE DURING THE FISCAL YEAR 1914—Continued.

| District. | Vessel or employee rendering service. | Vessel, etc., aided. | Nature of assistance. |
|-----------|--|---|---|
| 2d.... | Chester E. Morris, second officer, tender Anemone. | ..... | Went overboard to cut line that had become fouled in propeller; accidentally injured while 10 feet under water. |
| | Winfield L. Creed, keeper, Broad Sound Channel Light Station, Mass. | ..... | Rescued man who was clinging to rigging of overturned boat; also brought to shore body of man drowned by the accident. |
| | Tender Anemone..... | Schooner Grace Darling. | Towed to harbor disabled schooner anchored in dangerous and exposed position and flying signals of distress. |
| | Tender Mayflower..... | ..... | Picked up disabled fishing boat adrift with 2 men on board and towed it to harbor. |
| | Tender Anemone..... | Schooner G. M. Porter. | Schooner wrecked on Kill Pond Bar, Nantucket Sound, Mass.; crew of 5 men taken off and cared for on board tender overnight. |
| | Cross Rip Relief Light Vessel No. 9. | Schooner John Paul... | Crew of wreck picked up by light vessel, badly frozen, and cared for overnight; 1 man frozen to death. |
| 3d.... | Charles S. Curtis, keeper of Rose Island Light Station, R. I. | Power boat..... | Rescued men in disabled power boat fast going out to sea and towed boat to Newport. |
| | William L. Tutty, keeper, New Haven Light Station, Conn. | Power boat containing George Blumley and Arthur Sacht, New York Motor Boat Club. | Boat helpless from breakdown; towed to safety. |
| | William Tengren, keeper, Mussel Bed Light Station, R. I., assisted by his son. | Power boat..... | Rescued 2 women and 1 man from overturned boat. |
| | Edward M. Grant, keeper, Old Orchard Shoal Light Station, N. Y. |do..... | Went to assistance of disabled power boat at great risk; repaired its engine so party could proceed. |
| | George L. Costello, keeper, and Frederick C. Lovatt, second assistant keeper, Execution Rocks Light Station, N. Y. | Sailboat; R. Vogel, owner, New York. | Boat containing 6 persons on the rocks; women of party taken to lighthouse and made comfortable; boat towed to safety. |
| | Charles Redfern, keeper, Point Comfort Light Station, N. J. | ..... | Rescued Katherine Downey, 5 years of age, from danger of drowning. |
| | Edward M. Grant, keeper, Old Orchard Shoal Light Station, N. Y. | Power boat containing Messrs. Ulger, Opricola, Bernus, Chaphrewitz, and Kivol, all of Brooklyn, N. Y. | Boat containing men disabled $\frac{1}{4}$ mile off station; towed boat to station and gave men breakfast and dinner. |
| | Emil Usinger, assistant keeper, Great Captain Island Light Station, N. Y. | Sailboat; Walter J. Lyon, owner. | Ran upon rocks on northeast side of island; assistant keeper went to assistance of owner and 3 others and provided party with dry clothing. |

SAVING OF LIFE AND PROPERTY BY VESSELS OR EMPLOYEES OF THE LIGHTHOUSE SERVICE DURING THE FISCAL YEAR 1914—Continued.

| District. | Vessel or employee rendering service. | Vessel, etc., aided. | Nature of assistance. |
|-----------|---|---|--|
| 3d.... | Willis A. Green, keeper, Bridgeport Harbor Light Station, Conn. | Motor boat of torpedo destroyer U. S. S. McCall. | Cared for man, a survivor of crew of 4, who swam to station from a motor boat belonging to the McCall, which was run down by steamer Seaboard. |
| | Charles Schoeneman, keeper, Newport Harbor Light Station, R. I. | Power boat belonging to contractor building a wharf at Rose Island. | Boat drifted on rocks on west side of torpedo station; 1 man rescued and boat secured to prevent breaking up. |
| | Hans C. Anderson, keeper, Barber Point Light Station, N. Y. | Steamer Pearl, 30-ton freight boat, with 2 men, Geo. La Ventine and Chas. La plant, from Champlain, N. Y. | Ashore on a reef; assisted in getting boat off without apparent damages. |
| | Charles Redfern, keeper, Point Comfort Light Station, N. J. | Motor boat belonging to H. C. Smith, Marlboro, N. J. | Owner not able to navigate boat and lost his direction; brought ashore and boat secured. |
| | Wilbur M. Plumley, quartermaster, tender Mistletoe. | ..... | Rescued Robert Lund, steward, who fell overboard. |
| | Tender Gardenia..... | U. S. Army mine planter, Gen. John M. Schofield. | Assisted vessel when aground off Ellis Island, New York Bay. |
| | Charles W. Oliver, keeper, and Alfred Nelson, assistant keeper, Great Captain Island Light Station, N. Y. | Power boat Rex..... | Two men taken off power boat powerless in gale; taken to station and fed. |
| | Cornfield Point Light Vessel No. 48. | Power boat..... | Sent boat to assistance of disabled power boat and towed it into Saybrook Point. |
| 4th... | C. W. Atkins, master, lighthouse tender Iris. | Schooner Grace Seymore. | Pulled vessel off Brown Shoal, Delaware Bay, into deep water. |
| | Edw. W. Long, keeper, Old Reedy Island Light Station, Del. | ..... | Rescued 3 young ladies, adrift in rowboat about 3 miles from station, and towed them to Augustine Pier. |
| | William Spear, keeper, Deep Water Point Range Front Light Station, N. J. | Motor boat Monacy of Chester, Pa. | Towed boat to port; 5 men aboard; repaired engine for them. |
| | Do..... | Motor boat Jennie of Bristol, Pa. | Towed disabled boat to port; 2 men and 2 women aboard; examined engine and located trouble for them. |
| | C. W. Atkins, master, lighthouse tender Iris. | Four-masted schooner Margaret Thomas of Boston, Mass. | Ashore on shoal above Fourteen-foot Bank; pulled her off into deep water. |
| 5th... | Thomas Jacobson, keeper, Point Lookout Light Station, Md. | U. S. Navy flying boat C-1. | Rendered assistance to occupants when motor had become disabled. |
| | Tender Maple, Capt. Thomas J. Miles, commanding. | Gasoline launch Seaman's Friend, owned by Seaman's Friend Society of Norfolk, Va. | Towed disabled launch with 20 people on board to safety. |
| | Loch W. Humphreys, keeper, Cedar Point Light Station, Md. | Launch, name and owner unknown. | Assisted launch with 4 men aboard while in distress. |

SAVING OF LIFE AND PROPERTY BY VESSELS OR EMPLOYEES OF THE LIGHTHOUSE SERVICE DURING THE FISCAL YEAR 1914—Continued.

| District. | Vessel or employee rendering service. | Vessel, etc., aided. | Nature of assistance. |
|-----------|--|---|---|
| 5th... | Charles A. Sterling, keeper, Craney Island Light Station, Va. Tillman F. Smith, keeper, Washington, N. C., lighthouse depot. Daniel T. Paul, laborer in charge, Rumley Marsh Light, N. C. Robert H. Bertram, master, light vessel No. 80. | Mrs. A. J. Smith, of Portsmouth, Va. Lighthouse depot, Washington, N. C. Lighthouse property.. Light vessel No. 80.... | Recovered lady's watch accidentally dropped overboard. Saved buoys from going adrift from lighthouse depot in storm. Recovered lighthouse property after storm. Kept light displayed on light vessel with proper characteristics during storm. |
| | Alonzo J. English, keeper, and John M. Stowe, assistant keeper, Harbor Island Bar Light Station, N. C. | Harbor Island Bar Light Station, N. C. | Saved Government property in their charge during storm. |
| | Mumford Guynn, keeper, and James O. Casey, assistant keeper, Pamlico Point Light Station, N. C. | Pamlico Point Light Station, N. C. | Do. |
| | Wesley Austin, keeper, Ocracoke Light Station, N. C. | Ocracoke Light Station and Ocracoke Island, N. C. | Saved the Government property in his charge and gave shelter to the residents of Ocracoke Island during storm. |
| | John T. Shipp, keeper, and Thomas Quidley, assistant keeper, Neuse River Light Station, N. C. | Neuse River Light Station, N. C. | Saved the Government property in their charge during storm. |
| | Alexander T. Loss, mate, light vessel No. 71, and crew of light vessel No. 71. | Light vessel No. 71.... | Kept light vessel near her station during storm. |
| | Herbert R. Brownley, first officer, tender Juniper. | Power boat A. T. Pinner; owner unknown. | Rendered assistance to 3 men on board the power boat, which had become disabled near Beaufort Inlet, N. C. |
| | E. L. Thomas, keeper, Tangier Sound Light Station, Va. | Gasoline launch; owner unknown. | Rendered assistance to disabled launch. |
| | Tender Maple, Thomas J. Miles, commanding. | Schooner Carrie and Belle; owners unknown. | Took wrecked schooner in tow and beached her on Cedar Point, Md. |
| | Mumford Guynn, keeper, and James O. Casey, assistant keeper, Pamlico Point Light Station, N. C. | Small gas boat; owner unknown. | Rendered assistance to man in small gas boat which had broken down. |
| | E. L. Thomas, keeper, Tangier Sound Light Station, Va. | William A. Crockett, assistant keeper, Tangier Sound Light Station, Va. | Made brave but futile attempt to save the life of assistant keeper. |
| | Randolph Scarborough, master, light vessel No. 80, and crew. | Light vessel No. 80.... | Efficient service in handling light vessel and quickly returning her to station after she had parted moorings in hurricane. |
| | William G. Rollinson, keeper, and Barney F. Peel, assistant keeper, Hatteras Inlet Light Station, N. C. | Schooner Stow, of Hatteras, N. C. | Rendered assistance to grounded schooner with crew of 3 men. |

SAVING OF LIFE AND PROPERTY BY VESSELS OR EMPLOYEES OF THE LIGHTHOUSE SERVICE DURING THE FISCAL YEAR 1914—Continued.

| District. | Vessel or employee rendering service. | Vessel, etc., aided. | Nature of assistance. |
|-----------|---|--|--|
| 5th... | Charles C. Tyler, keeper, and Gary E. Powell, assistant keeper, Great Shoals Light Station, Md. | Gasoline launch; owned and operated by Horace Messick, Nanticoke Point, Md. | Rendered assistance to party of 4 persons in disabled gasoline launch. |
| | Tender Jessamine, master, Rufus A. Brooks, commanding. | Motor boat and schooner; owners unknown. | Towed disabled motor boat to safety and floated beached lumber-laden schooner. |
| | John B. Quidley, laborer in charge, Bogue Sound and Core Creek Lights, N. C. | Freight boat Georgie T, Capt. T. E. Gillikin. | Rendered assistance to disabled freight boat. |
| | Ole O. Johnson, keeper, and Robert Kuhn, assistant keeper, Cobb Point Bar Light Station, Md. | Lumber-laden power boat; owners, Olli Bailey and M. T. Wise, St. Marys County, Md. | Rendered assistance to disabled power boat. |
| | W. B. Clifton, keeper, and J. W. Cooper, assistant keeper, Roanoke River Light Station, N. C. | Launch Laura with a party of 4 persons aboard; owner unknown. | Rendered assistance to disabled launch. |
| | Harry H. Wills, keeper, and Robert Williams, assistant keeper, Craighill Channel Range Rear Light Station, Md. | Disabled gasoline launch; name and owner unknown. | Rendered assistance to 2 men in the disabled launch. |
| | W. H. Davis, jr., keeper, and J. M. Ellis, assistant keeper, Lazaretto Point Depot and Light Station, respectively, Md. | S. S. Charles H. Warner, man overboard from. | Rendered assistance to man, name unknown, helping in his rescue from drowning. |
| | C. A. Sterling, keeper, Craney Island Light Station, Va. | Gasoline boat laden with potatoes; owner unknown. | Rendered assistance to disabled boat, saving her and cargo. |
| | Do..... | Gasoline boat Daisy; gasoline and sailing vessel Mary Sen; owners unknown. | Rendered assistance to both boats and prevented them from running down station. |
| 6th... | Robert Cromley, assistant keeper, Sapelo Light Station, Ga. | ..... | Picked up at sea a motor boat belonging to private individuals which had been stolen. |
| | Kristofer Mathisen, first officer, and Gabriel Baeza, seaman, tender Mangrove. | ..... | Saved seaman on tender from drowning while relieving buoys, St. Catherine Sound, Ga. |
| | Iver Larsen, keeper, and Joel E. Hammett, assistant depot keeper, Castle Pinckney Depot, S. C. | Dory No. 10, Carolina Yacht Club; owner, Mr. I. Ancrum Finley. | Rescued crew from overturned boat, righted boat, and towed same to Yacht Club; also landed crew. |
| 7th... | Robert S. Meyer, keeper, and Clifton Lopez, assistant keeper, of Anclote Keys Light Station, Fla. | Power boats..... | Rendered assistance to one party aground in launch, and to 2 men in disabled power boat. |
| | Tender Magnolia..... | Steamer J. L. Luckenbach. | Assisted steamer, which was aground, into deep water. |
| | Do | Schooner Celia F..... | Towed schooner from dangerous position to deep water, saving schooner and cargo valued at \$100,000. |

SAVING OF LIFE AND PROPERTY BY VESSELS OR EMPLOYEES OF THE LIGHTHOUSE SERVICE DURING THE FISCAL YEAR 1914—Continued.

| District. | Vessel or employee rendering service. | Vessel, etc., aided. | Nature of assistance. |
|-----------|--|-------------------------------------|---|
| 7th... | Edgar J. Russell, keeper, Holton M. Roberts, first assistant keeper, and Theophilus Sawyer, second assistant keeper, of Dry Tortugas Light Station, Fla. | Steamer Venus..... | Brought crew of disabled ship to light station, and next day Assistant Keeper Roberts conveyed engineer of steamer to Key West, consuming 15 hours in the round trip. |
| | John Peterson, foreman, and H. P. Weatherford, keeper, of Fowey Rocks Light Station, Fla., with members of working party. | Schooner Alice B. Phillips. | Rendered assistance to disabled schooner. |
| | William Lester, keeper, and Jas. T. Williams, assistant keeper, of Gasparilla Island Range Light Station, Fla. | Power boats..... | Rendered assistance in saving two power boats which had gone ashore, and furnished shelter to men aboard. |
| | Tender Arbutus..... | Steamer Veenbergen.. | Hauled steamer off Rebecca Shoal into deep water. |
| 8th... | John Asplund, keeper; J. D. Ballislie, first assistant keeper; Engvald T. Eriksen, second assistant keeper, Galveston Harbor Light Station, Tex. | ..... | Rescued two men in Galveston Bay, Tex., whose skiff had become filled with water and were in danger of being drowned. |
| | Charles W. Heartt, keeper, Half-moon Reef Light Station, Tex. | Launch Nettle; owner unknown. | Towed disabled launch to port and furnished master and crew with food. |
| | Tender Sunflower..... | Steamer Appalachee; owner unknown. | Steamer had gone aground and tender floated her. |
| | George R. Smith, keeper, and Leon R. Smith, assistant keeper, of Red Fish Bar Cut Light Station, and Galveston Bay Light No. 2, Tex. | ..... | Rescued and cared for man from stranded sloop. Also saved a large portion of cargo, and when weather moderated got sloop off reef into deep water. |
| | Do..... | Power boat Florence; owner unknown. | Brought to the light station 7 men, passengers, and crew of power boat, which had blown ashore on a reef. |
| | Tender Sunflower, and Henry Rhein, laborer, Mobile Depot, Ala. | ..... | Extinguished fire on floating pile driver. |
| 9th... | Domingo Suarez Rosa, keeper, Guanica Light Station, P. R. | Pilot boat..... | Assisted pilot, whose boat had capsized near light station. |
| | Jose P. Castillo, first assistant keeper, Mona Island Light Station, P. R. | Motor boat..... | Assisted party of 7 persons in a disabled gasoline launch and cared for them until the arrival of a vessel to carry them to Mayaguez. |
| | Teofilo Ruiz, keeper, Cabras Island Light Station, P. R. | Schooner Maria Dolores | Rendered assistance with the station boat to the vessel, which had grounded near the light station. |
| | Manuel del Olmo, keeper, and Agustin S. Cruz, assistant keeper, of Cape San Juan Light Station, P. R. | Fishing boat Primavera. | Rescued from drowning a man from an overturned fishing boat. |
| | Tender Ivy..... | Sloop Horizonte..... | Assistance rendered to sloop, which with 6 men on board was dismantled and in distress. |

SAVING OF LIFE AND PROPERTY BY VESSELS OR EMPLOYEES OF THE LIGHTHOUSE SERVICE DURING THE FISCAL YEAR 1914—Continued.

| District. | Vessel or employee rendering service. | Vessel, etc., aided. | Nature of assistance. |
|-----------|---|--|---|
| 10th.. | Daniel D. Hill, keeper, Cross Over Island Light Station, N. Y. | Steamer John Lambert; owner, Great Lakes & St. Lawrence Navigation Co. | Brought master to shore in light-house launch when steamer ran on shoal about 1 mile from light station. |
| | Horace E. Walts, keeper, Sunken Rock Light Station, N. Y. | Launch Erin; owners, Messrs. Poole. | Furnished shelter for night and breakfast to 2 men and took them to Alexandria Bay, N. Y. |
| 11th.. | George W. Smith, keeper; Samuel Massicotte, assistant keeper, Round Island (Straits) Light Station, Mich. | Motor boat; owner not known. | Motor boat disabled in gale; 1 man taken ashore by keepers in row-boat. |
| | William L. Campbell, keeper; Lewis B. Curtis, second assistant keeper; tender Aspen. | Point Iroquois Light Station. | Saved station from destruction by forest fires. |
| 12th.. | Ross F. Wright, first assistant keeper, Manitowoc Light Station, Wis. | Tug Duncan City..... | Saving property. |
| | William Gordon, first assistant keeper, North Manitou Light Station, Wis. | Power boat..... | Towed boat to safety; repaired machinery, and supplied crew of 6 men with food. |
| | George J. Cornell, keeper, St. Joseph Pierhead Light Station, Mich. | Launch Wolverine.... | Prevented stranding by getting a line to boat and assisted in getting boat into harbor. |
| | William H. Nash, second assistant keeper, Wind Point Light Station, Wis. | Hydroplane Fire Fly.. | Rendered assistance to disabled machine and helped tow it to shore. |
| | Edward W. Knudsen, keeper, Racine Reef Light Station, Wis. | Motor boat..... | Towed into safety disabled boat with 4 people on board. |
| | Thomas Robinson, keeper, and Joseph Edlund, second assistant keeper, Muskegon Light Station, Mich. | Motor boat Ida L..... | Towed disabled motor boat to port. |
| | Emil C. Tews, first assistant keeper, Waukegan Harbor Light Station, Ill. | Small boat..... | Rescued from probable drowning a duck hunter in a disabled boat in heavy sea. |
| | Tender Hyacinth, master, John K. Olsen. | Steamer Cepheus..... | Pulled into deep water; steamer was ashore. |
| | Reynold W. Johnson, keeper; Nels Nelson, first assistant keeper, and Martin Larsen, second assistant keeper, North Manitou Light Station, Mich. | United States Mail Service. | Rendered assistance to 2 men carrying the mail who had been caught in the ice, and furnished them food. |
| | Do | Gasoline launch..... | Rendered assistance in saving launch which had been driven ashore, and furnished clothing, board, and lodging for 4 days to the 2 men on board. |
| | Tender Sumac, master, Charles H. Hubbard; first officer, Harry W. Maynard; second officer, George K. Brown, and crew. | Dredge Marion and tug Erie. | During storm 9 men were rescued from sinking dredge, and water-logged tug was towed into port. |
| 13th.. | Leslie T. Hill, mate-carpenter, and William V. Bailey, quartermaster; tender Goldenrod. | ..... | Went to assistance of drowning man. |

SAVING OF LIFE AND PROPERTY BY VESSELS OR EMPLOYEES OF THE LIGHTHOUSE SERVICE DURING THE FISCAL YEAR 1914—Continued.

| District. | Vessel or employee rendering service. | Vessel, etc., aided. | Nature of assistance. |
|-----------|--|---|--|
| 16th.. | W. J. Pearson, assistant keeper, Scotch Cap Light Station, Alaska. Gas boat Monaghan, chartered by Lighthouse Service. N. S. Douglas, keeper, Lincoln Rock Fog Signal Station, Alaska. Tender Columbine, first officer, J. W. Leadbetter, in command. Tender Columbine, Wm. E. Gregory, master. | Henry Taipus, prospector. Launch, had no name; G. J. Dela on board. Small boat; Nick Olsen, owner. Small skiff; W. Wells on board. Cannery tender Chilcoat, owned by Chilcat Cannery Co. | Subsisted detained man at station for 3 months. Picked up disabled launch in Stephens Passage and towed 6 miles to safe harbor. Stopped at the station seeking food, which was furnished. Picked up in Dixon Entrance and brought to Ketchikan. Mr. Gardner, superintendent of Chilcat Cannery Co., taken off wrecked vessel and carried to Haines. |
| 17th.. | Hans P. Score, keeper of Slip Point Light Station, Wash. Officers and crew of tender Manzanita. Officers and crew of Columbia River light vessel No. 88, Oreg. (David Ingram, mate in charge). Clifford B. Hermann, keeper; Carl Lien, first assistant keeper; Anders G. Berner, second assistant keeper, Destruction Island Light Station, Wash. Officers and crew of Columbia River light vessel No. 88, Oreg. Clifford B. Hermann, keeper; Carl Lien, first assistant keeper; Anders G. Berner, second assistant keeper; Ralph J. Nead, third assistant keeper, Destruction Island Light Station, Wash. Officers and crew of relief light vessel No. 92, on Columbia River light vessel No. 88 station, Oreg. Michael Ludescher, assistant keeper, Burrows Island Light Station, Wash. | Gasoline launch Spirit. Launch Elsie; name of owner unknown. Launch Jack Burnham. Schooner Aloha, R. Petterson, master; name of owner unknown. Unnamed launch; E. Berg and Chas. Lindstrom, owners. Launch Albatross; Ernest Fletcher, owner. Fishing boat O. 01394; name of owner unknown. Gasoline launch; name and owner unknown. | Rendered assistance to party of 3 men in launch, which had sunk about 5 miles from the station. Rescued a party of 6 persons from a disabled launch and brought them to port. Rendered assistance to disabled launch. Rendered assistance to officers and crew of the schooner Aloha anchored in distress near station. Sheltered on board light vessel during stormy weather. Rendered assistance in floating and beaching a launch which had run on rocks and sunk near the station. Picked up boat, gave men food, and turned them with their boat over to tug. Assistance rendered to party of 7 persons in launch disabled near the station. |
| 19th.. | Tender Kukui..... Do..... | Dredge Governor; Hawaiian Dredging Co., Honolulu, Hawaii. S. C. Allen; Allen & Robinson (Ltd.), Honolulu, Hawaii. | Helped to extinguish fire when dredge was burning. Assisted in an effort to pull the Allen off the reef at Diamond Head, Oahu; vessel lost. |

COAST AND GEODETIC SURVEY.

Extent and Efficiency of Service.

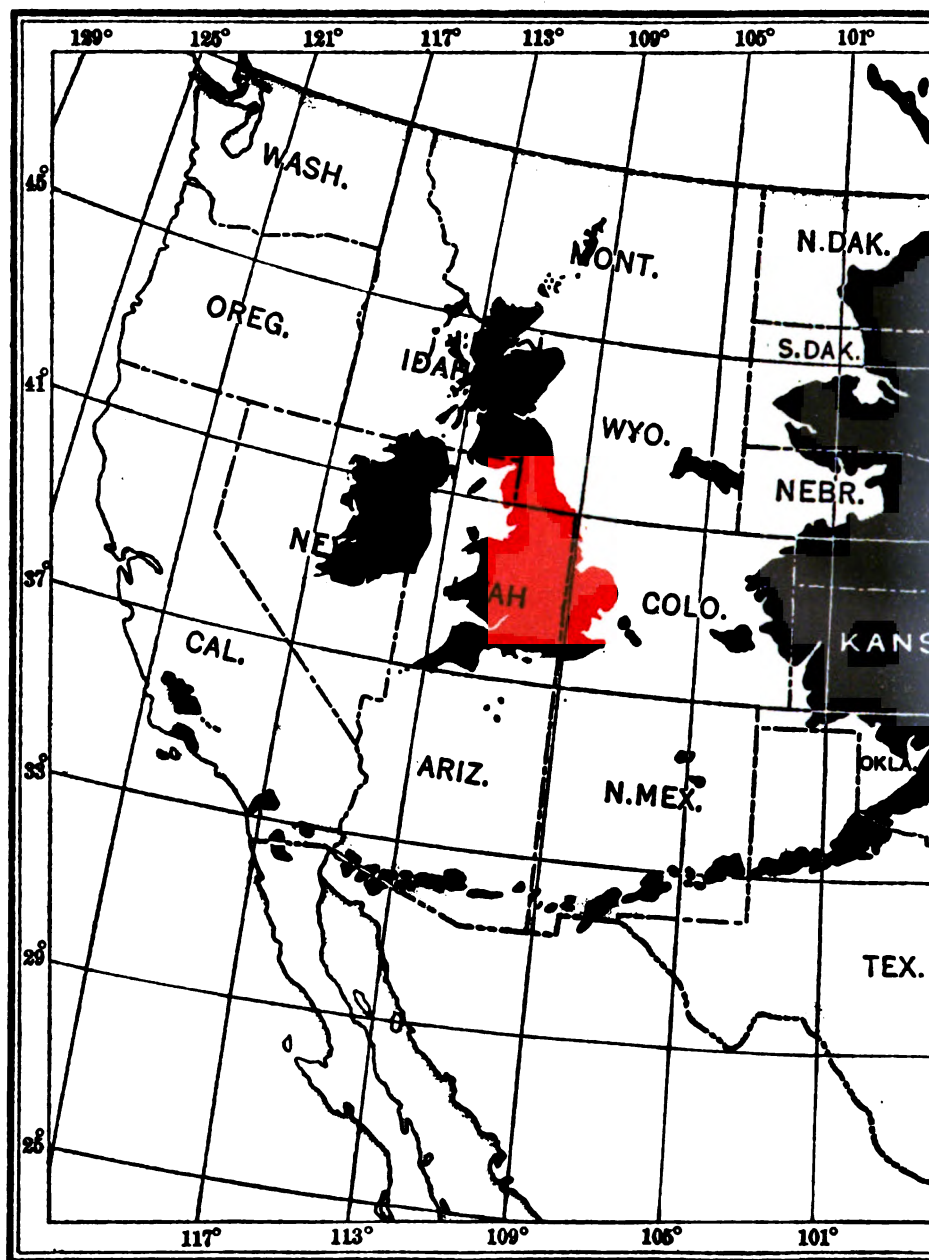
It has already been said that this is the greatest service of its kind in the world, and this is true. It has also been stated that the quality of its work is as high as its extent is vast, and this is also true. There are several times as many miles of coast in Alaska alone as in the entire United Kingdom of Great Britain and Ireland. The surveying and charting of the Philippines is by itself a far greater task than is imposed upon France on all her own marine borders in Europe. The surveying of the Hawaiian Islands, of Samoa, Guam, and Porto Rico is a greater task than is that of like work upon the European coast of Germany.

Facing this page is a map on which Alaska and the United Kingdom of Great Britain and Ireland are imposed upon the area of the United States. It will surprise some to find on looking at it that the reach of the Alaskan and Aleutian shores east and west is equal to the distance from Charleston, S. C., to San Diego, Cal., and that north and south it covers as much distance as from the Canada line to that of Mexico. The legend on the map further shows that for over four times the work we have 80 less officers and men and 2,000 less tonnage, while, if launches be excluded, we have nothing like the efficient fleet Great Britain provides for a work less than one-quarter our own.

It has been said that this service costs more than any other of the kind in the world. It ought to do so, for it is a vastly greater service than any other. It, therefore, should cost more, several times more, if we are to measure up to our plain duty in the matter.

If, however, this service were *relatively* to cost more than that of other lands, it would not be strange. No suggestion has ever been made that this is so, but if it were not so it would be surprising. No private business run under the conditions that have been forced upon this service could long exist. Its wonderful record of scientific achievement and practical value to our commerce has not availed to provide it in some respects with the ordinary means of efficient working. It has, indeed, invented and made instruments of precision of the highest value and produced apparatus and machinery of unique merit; but it is still

DIAGRAM SHOWING COAST LINE AND AREAS

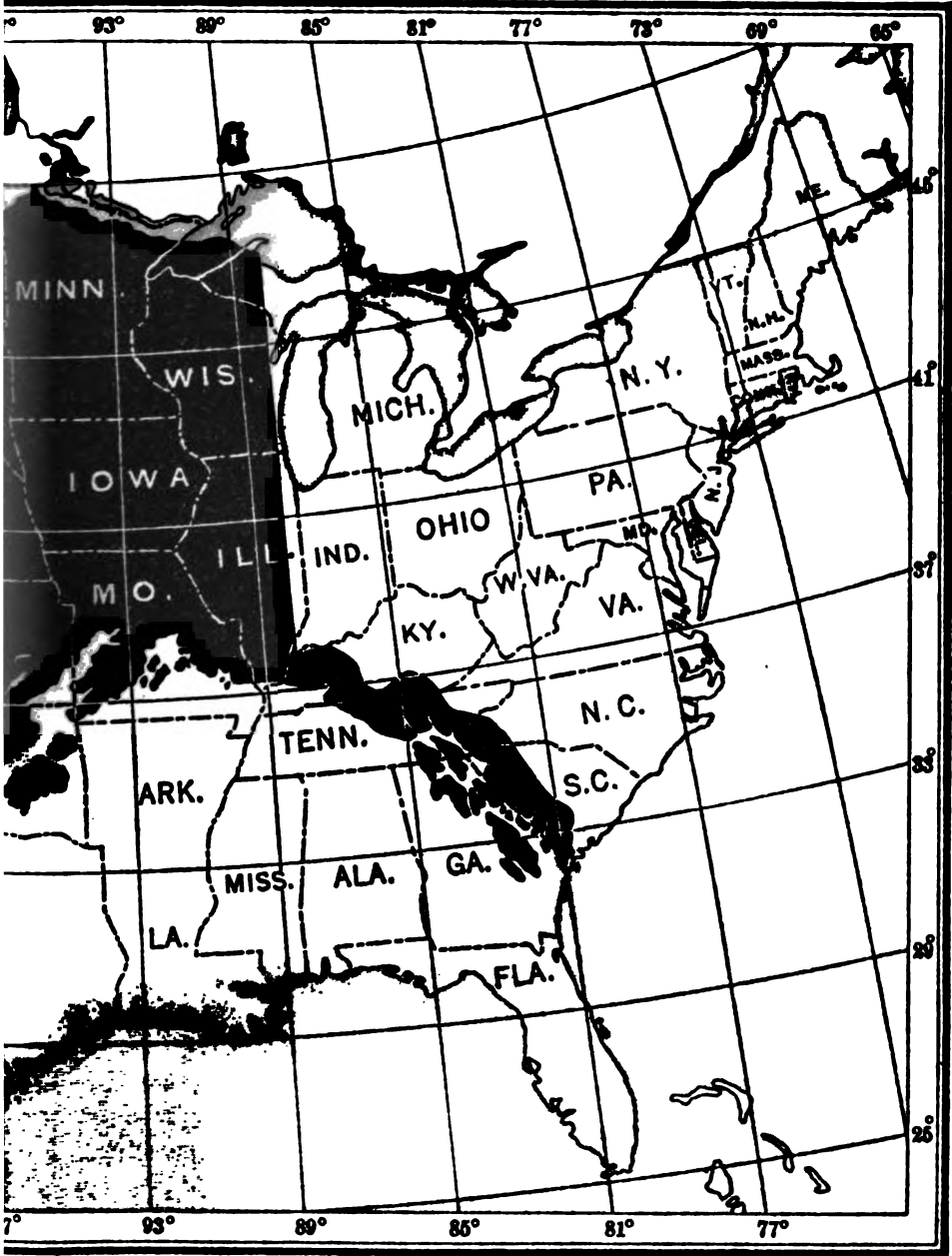


| FOR THE YEAR 1913 | NO. OF SHIPS | TONN |
|------------------------------------|-----------------|------|
| UNITED KINGDOM OF GREAT BRITAIN | 6* | 44 |
| U.S. AND ALASKA | 11 [‡] | 24 |

* LAUNCH SIZE VESSELS EXCLUDED

* " " " INCLUDED

· GREAT BRITAIN, UNITED STATES AND ALASKA



C. & G. S.

| OFFICERS AND MEN | RELATIVE LENGTH OF COAST LINE |
|------------------|-------------------------------|
| 420 | 1 |
| 340 | 4.3 |

forced, regardless of its services, to operate under conditions that would disrupt any less loyal body of men. It puts the nation to the blush that this great scientific service should operate under conditions which would in private business cause the discharge of the superintendent who allowed them long to continue. Let me be specific.

Inadequate Housing Accommodations.

It is a commonplace of industry to-day that unless the working force be well housed in buildings suitable for its work good results can not be had, and in no respect has the development of industry been more marked during the last decade than in the design and construction of efficient buildings. Congress has wisely recognized this in connection with the removal of the Bureau of the Census from its former wretched quarters to those they now occupy, whereby at once a direct saving was made in the annual outlay and an increased output of work secured, while the human factor, the employee, is permitted to work under righteous conditions.

With like wisdom Congress has provided for the Washington post office and the Bureau of Engraving and Printing, whose work is not more exacting than that required by the map-making processes of the Coast and Geodetic Survey.

Often heretofore has attention been called to the need for adequate accommodations for the offices and workrooms for the Coast and Geodetic Survey. The principal building now occupied was originally built with the idea of converting it into a hotel. It was not intended for the use to which it is put. It is not suited to that use. It is a makeshift, and a bad one. It is insanitary, not fireproof, and the arrangement of the rooms is such as to prohibit the efficient conduct of the operations which have to be conducted therein.

By scrupulous care the old building is made to look fairly well, but with its machine shop and its drafting room broken up into separate small chambers, without direct connection and with the numerous floor levels that exist therein, it is hopeless to look for economical labor. The outlay of money to make it right would not be an expense, but an investment. Wise expenditure is here, as elsewhere, true economy.

What has been said about levels suggests the curious state of affairs which exists in this ill-assorted group of buildings. There are 16 different levels in the Richards Building, though it is but

6 stories including basement. There are 10 different levels in the Butler Building, though it is but 5 stories including basement. In the printing office are 7 different levels, and in the carpenter shop 3. In these days, when it is a commonplace that such conditions are to be avoided, this state of affairs can only be permitted to continue on the assumption that the waste it causes is either unknown or desired, or that the country lacks the means to correct it. The facts are now made known. The Department does not desire them to continue.

Not only is the main building, which was erected more than 40 years ago, not fireproof, but that in which the records are stored is little better. There is constant danger of the destruction of valuable records, of engraved plates, and of costly instruments by fire.

The walls of some of the buildings, after being twice condemned by the authorities of the District of Columbia, were shored up to keep them from falling. An appropriation of \$12,500 was granted during the current fiscal year to correct this condition and the plans for the repairs have been approved. The buildings have been the subject of a recent report by the Public Health Service. The officer making the inspection for that Service condemned the sanitary conditions of the buildings in strong but not exaggerated terms. With the exception of a few minor matters, which were immediately corrected, the conditions criticized are inherent in the buildings and can not be remedied until adequate accommodations are provided.

It goes without saying that the making of charts requires the best of light. Ample, well-diffused daylight is essential in order to deal properly with the fine details which are a necessary feature of the work. One finds it hard to read maps without good light; how much more to make the same maps? In this important respect of light, and not only in this respect but in those of heating, ventilation, and proper arrangements for supervision, the whole building plant is out of date and discreditable to the Government.

Replacing of Unseaworthy Vessels.

Faulty, however, as the buildings are which the Coast and Geodetic Survey is forced to occupy, some of the vessels which it is required to use are even worse. It is a shameful thing to send officers of the United States to sea in such ships as the *Endeavor*, the *Gedney*, and the *McArthur*. To require the continued use of these ships is but little removed in wisdom from a policy which

would refuse to build a modern battleship because the old *Constitution* was still in existence. With a loyal willingness to accept the dole handed them by a great Government, the service has continued these ships in use. It can do so little longer. By the time new vessels can be built to replace them it will be a grave question whether these ships can be sent to sea at all and whether the important work they do must not be stopped till safe vessels are provided. I have personally examined the three ships of which I speak—the *Endeavor* at Lewes, Del., the *Gedney* at Seattle, Wash., and the *McArthur* at Bremerton, Wash.

These ships have earned an honorable repose. I trust they may survive to get it without carrying with them ere it is gained the officers and crews whose misfortune it is to be continued in their use. If for a moment it were conceded, which it is not, that the Coast and Geodetic Survey was itself negligent and extravagant, there would still remain no reasonable excuse for the continued use of these ships. They are expensive luxuries, costing largely for maintenance, extravagant in the waste of time and fuel and likely to be even more extravagant in the waste of lives.

These old, obsolete ships, without wireless equipment and deficient in many modern appliances, can not be safely used except in protected waters. The expense of repairing them is great and becoming greater. The *Endeavor*, now working in sheltered waters on our Atlantic coast, can not be sent to the Pacific, since she could not survive the voyage. The steamers *Gedney* and *McArthur*, while still employed on surveys in sheltered waters in the Pacific, are unfit for the service. These three steamers are, respectively, 52, 39, and 38 years old, are single-screw, single-cylinder, and single-boiler coal-burning vessels, without electricity for wireless or for lighting, without refrigerating plants, without condensers to make fresh drinking water, and with quarters such as were, indeed, permissible at a somewhat remote age in our marine development but which, like their other equipment, are now medieval.

The *Endeavor* is a relic of the Civil War and was built in 1862 as a Confederate gunboat. She cost \$20,467 in 1867. The main deck is about 2 feet above the water line and on it is built a light, wooden superstructure, which includes the entire space to the rail on both sides. In this inclosure are 12 square windows, 22 inches by 21 inches, 6½ feet above the water line, with ordinary one-eighth inch thick window glass. Although, with due regard

for her venerable years, a fairly good sea boat when running head on, or before the wind, yet with her low freeboard and open gangways the main deck is more or less filled with water in a moderate sea, while a sea 4 or 5 feet high will break over the bulwarks. With an ancient engine of a single-cylinder, keel-condensing type, such as sensible men everywhere else have long discarded, the *Endeavor* will at full speed, under favoring conditions, make 8 knots per hour. With a head wind and a seaway, however, she will at full speed not exceed 5 knots per hour. In a heavy sea, such as is common along our shores, she will make little or no headway at all.

The vessel is 111 feet long, 18½ feet wide, and draws, loaded, 8½ feet of water. Because of her superstructure, with the boats thereon, with such a narrow beam, the vessel is top-heavy, and if caught outside in bad weather she has neither speed nor power to make a harbor. It is doubtful if in half a gale of wind she has power enough to keep head to the sea. The afterhouse, inclosing the cabin and wardroom, will not stand much battering and the windows therein have been smashed by a moderately heavy chop sea, such as is common in Chesapeake Bay.

It seems needless to say that this ship has no modern conveniences. None of these vessels has. Her quarters are both inadequate and insanitary. The officers are crowded in an open wardroom, used alike for sleeping, eating, and living, with the lavatories in the same room. They are without a bathroom.

The crew of 15 men must live, eat, and sleep in an open space 29 feet long by 13 feet wide by 6¼ feet high. This is ventilated by a hatch and two small pipes, one on each side. There are no windows. The hammocks hang directly over and a little above the table from which the men eat. Four petty officers are quartered in two small staterooms on the main deck and two men sleep in the shaft alley.

I protest, in the name of ordinary decency, against being obliged to continue such a vessel in service.

The storage room for the ship's supplies, provisions, and fresh water is entirely inadequate for convenience, for health, and for economy. The average annual cost for repairs to this vessel during the last 10 years has been \$2,123, a total of \$21,229.47, or 104 per cent of the original cost, in one-fifth of the time she has served. The same average amount will be required for repairs at the close of the present season's work.

She is quite as unfit as a working tool for the duty she performs as she is in other respects. She steers by hand. Her windlass is operated by hand. She is altogether an admirable example of what a vessel for this purpose ought *not* to be. If she were a living man instead of a dead vessel, she would be granted an honorable pension and sent to a soldier's home.

From this ancient and honorable veteran we pass to the steamer *McArthur*, which is one of the means the service has for the truly colossal task of surveying and charting the coast of Alaska. This vessel is 115 feet long, 20½ feet wide, and 12 feet draft loaded. She has a single-cylinder engine which, when conditions are good, will drive her 8 knots an hour at full speed, and against a moderate sea at 6 knots. She has not sufficient power to safely weather a heavy storm in open waters. The design and type both of engine and hull are long out of date. They were both built in 1874. The boiler was built in 1889 and was then designed for a pressure of 110 pounds. Its safe limit now is 80 pounds. The vessel's captain advises me that a similar hull equipped with a modern high-pressure boiler and engine would be propelled at a saving of nearly 50 per cent over the present motive power of the *McArthur*, but that the installation of modern machinery in the vessel is not justified in view of her great age.

The hull, like that of the *Endeavor*, was solidly built and is still in fair condition, but the deck of the superstructure is light and weak. This vessel has been used for 38 years, and during the last 10 years the average cost for repairs has been \$3,123, a total of \$31,234, or 56 per cent of the original cost, which was \$55,000. She has reached that stage, therefore, where in a quarter of her working life it has cost one-half of her original expense to keep her fit for service. Not less than \$2,000 will be required for repairs at the close of the present season's work. She is not in good condition for her service and should not be assigned to any duty where she will be subject to severe strains.

On this ship also officers live, eat, and sleep in an open ward-room, used also for an office and drafting room, and there is no bathroom. The ship has no electricity or evaporator to make fresh water and no refrigerating plant. Her storage and coal capacity are too small for work at a distance from supplies. The weak deck and superstructure have been strengthened by iron stay rods. She may hang together a while longer, but if in her duty she is caught suddenly in a heavy sea there is a good chance of her never coming back.

A few other details of the *McArthur* will show the generous(?) attention with which this service has been treated. One of the staterooms for petty officers on that ship is $8\frac{1}{2}$ by 4 feet and contains two berths, which the boatswain and carpenter occupy. Another is $5\frac{1}{2}$ feet by 11 feet and contains three bunks and a washstand. A third room is 12 feet by 5 feet and contains four bunks, and the fourth and last is occupied by the steward and the two cooks and contains three berths in a space $5\frac{1}{2}$ by 7 feet. For the crew a washstand is provided with three basins for 18 men. There is no bath or shower either for the crew, the petty officers, or the firemen. There is no place to carry fresh meats or vegetables for the crew. When the crew have fresh meat it is hung over the windlass until it is used up.

The captain states that in surveying equipment the *McArthur* has always been deficient. She was built before launches were available and her superstructure is so frail that a suitable steam launch can not be hoisted on board. Consequently, as she must use a launch for surveying work, an anchorage has to be selected where the launch is safe overnight afloat because the ship is not strong enough to hoist it on board. Frequently, therefore, the launch is towed to a safe harbor in the middle of the night because it can not be hoisted. Since it is impracticable to tow the launch long distances outside of sheltered waters, the *McArthur* is obliged, when making surveys at a distance, to go without her launch and resort to pulling boats. This increases greatly the cost of her work. A proper equipment for a vessel in this service would be two efficient steam launches. The *McArthur* has but one and that she can not hoist on board.

The last of this trinity of weaklings is the steamer *Gedney*. This vessel also we are required to use in Alaska, though she is dangerous when it blows. The *Gedney* is 140 feet long, $23\frac{3}{4}$ feet wide, and draws, loaded, $8\frac{2}{3}$ feet. The hull and engine are both of a design and type long out of date. Both were built in 1875 and have been in regular use for 39 years. The old, single, vertical, direct-acting engine, which any modern factory would throw in the scrap heap rather than use longer, can under favoring circumstances drive the vessel at an average speed of $7\frac{1}{2}$ knots per hour. As every engineer knows, this old single-cylinder type is likely to be caught "on the center," a dangerous situation when in close quarters or in a heavy seaway, as it temporarily deprives the vessel of her power.

The hull, which is composite, with iron frames and wood planking, is weak. The frames are thin in places and the deck is old and worn. The ship can not be safely assigned to any duty where there is severe strain. The average annual cost for repairs during the last 10 years has been \$2,160, a total of \$21,600, or 34 per cent of the original cost, which was \$63,400.

It will be noted respecting these three vessels that the ship which cost the least has required the greatest outlay for repairs and the ship which cost the most required the least outlay for repairs. This is quite normal and points a warning against the expensive policy of purchasing secondhand vessels because they are cheap. There can hardly be a more expensive investment than a cheap ship.

The *Gedney* has, of course, no electricity nor any apparatus to make fresh water or for refrigerating. The petty officers have no mess room. The six officers of the ship are quartered in a small, open wardroom which answers the threefold purpose of sleeping, dining, and living. She has not storage room enough for the provisions necessary for an Alaskan season, making it necessary frequently to return to port at considerable expense. At the close of the present season about \$2,000 will be required to put the ship in as fair a condition as is possible for so old a vessel for another season's work.

The *Gedney's* commanding officer advises under date of August 21:

It is impossible to examine the iron plates used for diagonally strapping the frames, but it is safe to state that their strength is more than half gone.

Quite apart from the utter unfitness of these vessels for their work and from the danger of operating them in heavy weather is the fact that the slow speed of a surveying vessel in Alaska or along the coast of Oregon or Washington results in a costly waste of time. In executing the details of surveying there is constant necessity for landing parties at points distant from anchorage or from the rendezvous of the launches which are in use. The ship has to proceed from her anchorage with sounding or other work, must then return, pick up parties, and go back to the anchorage or to points where other parties are waiting. Often the working ground is 15 to 20 miles (2 to 3 hours' steaming) from an anchorage. In such a case a slow vessel loses an hour in the morning and an hour in the afternoon. On a working ground with such weather conditions as prevail off Alaska, where rain, fog, and gales prevent or

hinder actual results on from one-third to one-half the working days, it is within the truth to say that slow speed reduces the output of a vessel from 10 to 20 per cent.

The captain of the *McArthur* informs me that during the current season, 1914, on several occasions he has started one party out from the ship, then landed another 5 to 8 miles away, then run 20 miles to occupy a triangulation station. After the triangulation party returned to the vessel he had then to return to the original anchorage 12 to 14 hours after landing the first party. He states that "any of our commanding officers can cite numbers of seasons where the total time of running to and from work would amount to from 100 to 200 hours." The obvious costliness of keeping vessels at this service whose speed is but half that which is ordinary to-day is as wise as it would be to send a messenger on urgent business with instructions to walk rather than ride.

There is no doubt that the great work of surveying and charting Alaska is taking much longer and costing much more than it ought by reason of the unfitness of the vessels for their work. The vessels in our ocean service should have power sufficient to work off a lee shore in bad weather, to make every hour of good weather count for work upon the finished charts, to cut down to the utmost the time required for returning to port for coal or supplies, to tow other vessels in danger, or to render assistance when other vessels are in distress. The costliness of using boilers and engines of inefficient design on a coast where coal costs from \$8 to \$13 per ton is too obvious to need comment.

Poor, however, as these vessels are the Coast and Geodetic Survey is not provided with funds sufficient to use them all the time they should be available. A summary of employment of the *McArthur* during the fiscal year 1914 follows:

| | Months. | Days. | Per cent of year. |
|--|---------|-------|-------------------|
| Time in field work, including passage to and from work, July 1-Nov. 12, Apr. 22-June 30..... | 6 | 20 | 55.5 |
| Repairs, navy yard, Puget Sound, Wash., Feb. 19-Apr. 6..... | 1 | 16 | 4.4 |
| Boiler repairs at Seattle, Feb. 12-18..... | | 6 | |
| Completing crew, outfit, adjusting compasses, etc., Apr. 6-22..... | | 16 | 4.4 |
| Time idle, laid up for lack of funds Nov. 12-Feb. 18..... | 3 | 2 | 25.5 |

From the above it is evident that the vessel was laid up for lack of funds to operate her 25 per cent of the entire fiscal year. This was during the period from November 12 to February 18,

when, of course, she could not be used in Alaskan waters. There was, however, abundant work for her to do along our Pacific coast, where she was laid up, which could not be done because there was not money to run the ship.

In the case of the *Gedney*, also, the time spent upon work was 8 months and 9 days; that needed for repairs was 21 days, and this ship also was idle 3 months for lack of funds. This, too, was in the winter season when she could not work in Alaska, but there was nothing save lack of money to prevent her working elsewhere.

Emphasis is laid upon these facts because before the Appropriations Committee of the House of Representatives a different view was urged. It is, however, the plain fact that even these poor instruments are not used for a large part of the time because there is not sufficient money.

It is not necessary to send these worn-out ships in winter to a great distance from their home port (Seattle) in order to find them useful occupation. There is plenty of work for them to do which lies close at hand. If quiet days can not be found in which to send them as far as San Francisco Bay, there is work enough to be done in the sheltered waters of Puget Sound, Grays Harbor, Willapa Bay, and the Columbia River. In some of these the shifting channels make resurveys necessary. They have not been made because the Department had not the means to keep these vessels in commission to do the work. They were, instead, laid up near by.

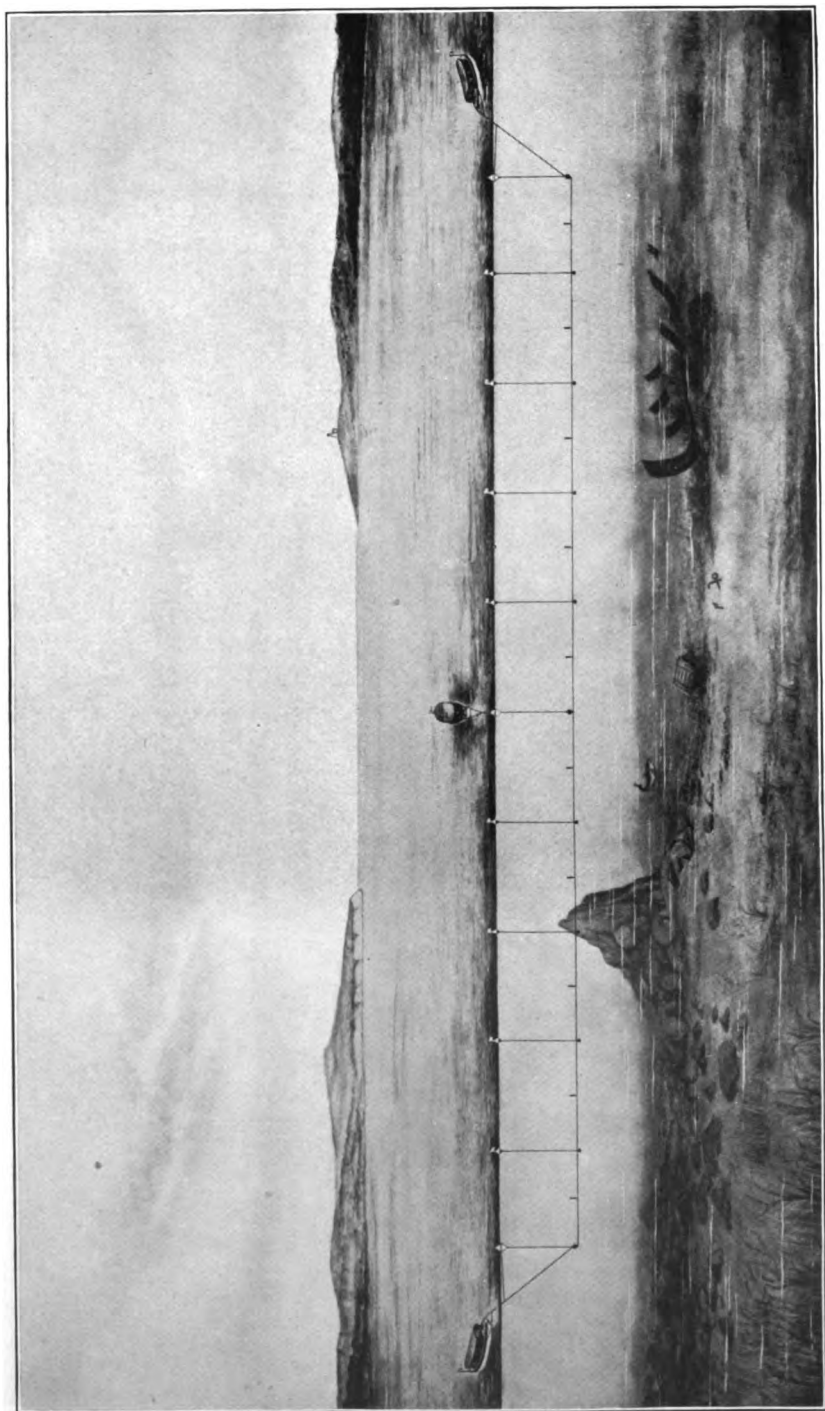
This is perhaps the place to add that there is a very large amount of survey work needed all along the Pacific coast, especially on banks and reefs as yet only imperfectly developed. Such are Blunts Reef, off Cape Mendocino; Heceta Bank, off the Suislaw River; and a bank 12 miles off Alseya River. The offshore work from the Mexican boundary all the way to Cape Elizabeth, Wash., a stretch of 1,200 miles, is incomplete, and there is one reach of 150 miles from Cape Blanco to Cape Lookout where no systematic work has been done. Detailed development work is needed off all the projecting points of the coast, such as Points Conception, Buchon, Lopez, Cape Mendocino, Eel River, Humboldt Bay, Trinidad Point, St. George, Cape Blanco, Cape Lookout, etc. The entire Pacific coast will not be as safe as it ought to be till this work is done. For it strong seaworthy vessels with ample power and wide steaming radius are necessary. Neither of the three old ships mentioned can be risked in such service.

It is proposed to replace these three vessels with staunch sea-going ships each 130 feet on the water line, about 500 tons, with twin screws, compound engines, two independent water-tube oil-burning boilers, electric plant for wireless signals, lights, and all auxiliaries, fresh-water condensers, refrigerating plant, etc. Sanitary and comfortable quarters and sufficient working space will be provided for the crews and officers. These vessels go on cruises of six or seven months' duration in places remote from settled regions, and they should carry an outfit and complement capable of meeting emergencies.

Three small steamers (large launches) are also required to take the place of launches now hired for wire-drag work on our Atlantic shore and to meet the constantly recurring demands for resurveys on that coast. These vessels will be each 75 feet long, twin-screw, with internal-combustion compound engines, from 90 to 150 horsepower, compressed air for auxiliaries, acetylene light, sanitary quarters, and with working space for four officers and eight men. At present the officers and men have to stay in hotels or boarding houses on shore. Such accommodations are often lacking near the working ground, causing a serious reduction of the available working time and increased expense.

A list follows of the vessels now employed by the Coast and Geodetic Survey.

| Name. | Length. | Breadth. | Gross tons. | Where and when built. | Age. |
|--|--------------|--------------|-------------|-------------------------------------|---------------|
| <i>Employed on the Pacific coast.</i> | <i>Feet.</i> | <i>Feet.</i> | | | <i>Years.</i> |
| Gedney..... | 140.0 | 23.8 | 244 | New York, 1875..... | 39 |
| McArthur..... | 115.0 | 20.0 | 220 | Mare Island, 1876..... | 38 |
| Patterson..... | 163.0 | 27.0 | 500 | Brooklyn, N. Y., 1882..... | 32 |
| Cosmos..... | 52.5 | 12.0 | 30 | Mare Island, 1887..... | 27 |
| Yukon..... | 75.0 | 15.7 | 38 | New York and St. Michael, 1898..... | 16 |
| Taku..... | 70.6 | 16.5 | 54 | San Francisco, 1898..... | 16 |
| Explorer..... | 135.0 | 27.0 | 335 | Wilmington, Del., 1904..... | 10 |
| <i>Employed in Philippine Islands.</i> | | | | | |
| Pathfinder..... | 168.0 | 33.6 | 690 | Elizabeth, N. J., 1899..... | 15 |
| <i>Employed on the Atlantic coast.</i> | | | | | |
| Bache..... | 153.2 | 26.2 | 370 | Shooters Island, N. Y., 1901..... | 13 |
| Endeavor..... | 111.0 | 18.5 | 130 | Norfolk, Va., 1862..... | 52 |
| Hydrographer..... | 101.0 | 19.5 | 116 | Port Jefferson, N. Y., 1901..... | 13 |
| Matchless (schooner)... | 91.0 | 25.0 | 118 | Key West, Fla., 1859..... | 55 |



OPERATION OF THE WIRE DRAG.

Extension of Wire-Drag Service.

But the restrictions placed upon the Coast and Geodetic Survey through improper housing and ancient vessels are not all the burdens this service has to bear. It is not provided with the necessary apparatus for making the soundings which it is required by law to carry on and for which it exists. Sad experience has shown that the ordinary sounding apparatus will not detect that dangerous foe of the navigator—the pinnacle rock. On various points of our coast sharp spines of rock project from the bottom with points so small that a sounding line glances off. Two such have within recent years caused serious losses. One was the means of sinking the lighthouse tender *Armeria* on May 20, 1912, causing a loss of \$175,000, and another sank the steamship *State of California* on August 17, 1913, with a loss of 31 lives and \$350,000 value in property. Half the cost of these two wrecks used in surveying with the only apparatus for the purpose would have gone far to making the coast of Alaska safe. In cases of this kind the use of what is known as a "wire drag" is essential to make channels and harbors safe for vessels. There is no other method by which safety can be assured, and the extension of this work is an urgent necessity not only in Alaska but along other portions of our coast.

The wire drag is a device by which a long wire, maintained at any desired distance below the surface of the water, is towed over the area to be examined. The action of one of the many buoys which support the wire indicates the presence of an obstruction and its location. This device surely finds such obstructions. Nothing else will do so. As the speed at which such a device can be towed is but from 1 to 2 miles an hour, to which must be added the time taken in buoying the obstructions met and in determining their exact depth and position, the work is necessarily slow though thorough.

As large areas are involved, it is imperative that the work be taken in hand as soon as possible with as large a force as funds permit. A wire drag has been used during the open season of 1914 in the harbor of Portland, Me. The officer in charge of the work states that it has demonstrated—

That a number of submerged ridges lie almost across the track of vessels entering the harbor.

That the depths on these ridges are unequal, many of the higher knobs constituting dangers to deep-draft vessels.

It further appears from the records of this work that—

1. It is now possible to select a safe channel for the deepest draft vessels.
2. Certain channels which were being considered for improvement have been proved unsuitable.
3. Harbor improvements may now be considered with a full knowledge of the conditions in the approaches.

In other words, the nature of the bottom of Portland Harbor, though often surveyed, is now for the first time accurately known and navigation and improvement may proceed intelligently.

A wire-drag party was organized in 1906 on the Atlantic coast, since which year it has worked in southern waters during the winters and in northern waters during the summers. In these eight years it has found 3,300 rocks with less water over them than the charts showed. Of these, 893 were distinct menaces to navigation. These last were distributed as follows:

| | |
|--|-----|
| Coast of Maine..... | 400 |
| Coast of Massachusetts..... | 87 |
| Block Island and Long Island Sounds..... | 65 |
| Coast of Florida..... | 300 |
| Coast of Porto Rico..... | 25 |
| Panama Bay..... | 16 |

The Department requested of the Congress for the current fiscal year an appropriation to furnish vessels in place of the antiquated ships above described and also such an increase (from \$165,000 to \$225,000) in the appropriation for surveys in Pacific waters as would permit the operation there of a wire-drag apparatus. In this request the five steamship companies whose vessels navigate Alaskan waters joined. Both requests were refused. The owners of one of the steamship lines trading in Alaska, who have recently lost a valuable steamer on that coast, have announced their intention of withdrawing from one of their routes there its largest vessels until the surveys have been far enough advanced to guarantee safe navigation. It is needless to say that insurance rates on unsurveyed portions of the Alaskan coast are so high as to be almost prohibitive.

The plan of discovering hidden rocks by running vessels on them is still in vogue. This does not commend itself as a business proposition, apart from the humanity of the case. It has been such common practice, however, that rocks are commonly named after the steamer which hit them. For example, in Tongass Narrows, Alaska, are Idaho Rock, Ohio Rock, Potter Rock, and California Rock, each named after the vessel which discovered it by striking it.

The Department has endeavored to make plain the urgent need for funds for this vital work. The appropriation which was granted contained not an additional dollar for either purpose and is not of itself sufficient either to operate its existing old vessels the full period in which they ought to be used or to provide for wire-drag surveys anywhere on the Pacific coast.

In a schedule on a later page, showing in detail the use of funds by the Coast and Geodetic Survey on the Pacific, it will be noted that an allowance has been made of \$15,000 for wire-drag work in Alaska. This has been possible only by laying up our surveying steamers a still longer time in the spring, so as to permit diverting this money. In other words, having to work with insufficient funds we must leave some of our vessels idle longer than usual. Having informed Congress that this work with the wire drag is of vital importance in Alaskan waters, it is interesting to note what the results have been of the little we have thus been able to do. It has been confined to Tongass Narrows, Nichols Passage, and Revillagigedo Channel, Alaska, a distance of about 40 miles with widths varying from three-quarters of a mile to 5 miles.

Complete results of the work have not been received, but 14 pinnacle rocks that are a certain menace to navigation within this area have been found. These rise abruptly from depths varying from 5 to 100 fathoms, and are of a character which preclude their discovery by the ordinary methods employed in maritime surveying.

A little experiment in wire-drag work in this small area, which had previously been sounded with the lead line and is one of the most important highways for shipping in Alaska, has therefore developed in a few weeks' time 14 menaces to vessels that have been hitherto unknown. In 6 cases there were less than 8 feet of water over the pinnacles and in no case as much as 32 feet. In one case a rock that was less than 3 feet beneath the surface had 65 feet close beside it; in another case where the pinnacle was within 14 feet from the surface there were 162 feet beside it. The charts we have, which are based on surveys with the lead line, give no indication of these certain destroyers of ships, nor would the use of the lead line by the navigator give any warning. Being of small extent, rising almost perpendicularly from greater depths, they probably could never be found in surveying by the lead line. It would be a mere lucky chance if they were. There are two

methods known to find such dangers. One is that we have hitherto tried—it is that of finding them by running ships upon them. It is costly in life and property, but it is the only method which till now has been used. The other is to use the wire drag, but this, if well done, will cost something like \$60,000 a year. It will save ships costing many times that every year, as the records show.

It is well to have found these 14 pinnacles, but it points to a great and immediate need of more work of the same kind, and if one were to say stop your surveying steamers still more in order to do this wire-drag work, let the dead voices and the sunken ships from unsurveyed Alaskan shores give him their answer. Will the people of the United States regard with patience an attitude which says substantially, "Let ships go down and let the people drown. We can not afford either to keep our surveying vessels moving the season through or to provide the only form of sounding apparatus that in those waters is certain to insure safety." If we refrain from this necessary work, we must, as a nation, either confess poverty or indifference or deny the facts or allege that something else is of more value than human life. What shall the answer be?

As this report is written the urgent need for surveys and soundings in Alaskan waters is again accentuated by the loss of the United States revenue cutter *Tahoma*. The report of the captain commandant of the Revenue-Cutter Service on this accident is printed below, together with the letter from the Secretary of the Treasury transmitting same.

TREASURY DEPARTMENT,

Washington, October 5, 1914.

MY DEAR MR. SECRETARY: The captain commandant of the Revenue-Cutter Service has submitted to me a memorandum in connection with your letter of the 23rd ultimo, regarding the lack of proper survey of certain portions of the coast line of Alaska and its bearing on the recent loss of the *Tahoma*, and I am inclosing this memorandum for your information.

I quite agree with Captain Bertholf in his conclusions; the lack of correct charts makes navigation in Alaskan waters a hazardous undertaking not only for our revenue cutters but for all other vessels which are compelled to operate in that portion of our territory. It does seem that the Government should make more effort to have proper surveys made and charts drawn to cover all of our coasts. I hope you will be able to obtain sufficient appropriations to equip your Coast Survey with the proper ships to carry on this important work.

Sincerely yours,

W. G. McADOO.

HON. WM. C. REDFIELD,
Secretary of Commerce.

[Inclosure.]

REVENUE-CUTTER SERVICE.

Memorandum for the Secretary,
From the Captain Commandant.
Subject: Incorrect charts of Alaska.

Referring to the accompanying letter from the Secretary of Commerce dated September 23rd, suggesting that the unfortunate loss of the *Tahoma* in Alaskan waters very pointedly illustrates the need for accurately charting that portion of our coast, the following is respectfully submitted.

The *Tahoma* was returning to Unalaska from a cruise along the Aleutian Chain, whither she had been dispatched to collect the shore parties that had been established at the islands of Atka, Kiska, and Attu to observe and guard against illegal operations on the part of sealing vessels. She left Attu, the westernmost island of the chain, either late on the night of the 19th or early on the morning of the 20th, and at 5 p. m. of the 20th she ran upon a reef. Complete information has not yet been received, but her reported position when she struck was 30 miles from the nearest island and where, according to the charts published, she had every reason to expect a depth of water in the neighborhood of 300 fathoms.

The steamer *Cordova*, bound from Nome to Seattle, was communicated with by radio and sent to assist the *Tahoma*; the Coast Survey steamer *Patterson* and the whaler *Kodiak*, which happened to be in Unalaska Harbor at the time, likewise proceeded to the assistance of the cutter. The *Cordova* picked up 30 miles from land one boat of the *Tahoma* containing 11 men, which had been at sea five days and five nights; another boat was picked up on the east side of Agattu Island; a third boat on the south side of Agattu Island; a fourth boat on the south side of the Semichi Islands, which are 20 miles north of Agattu Island; and on the 28th the *Patterson* recovered the three remaining boats of the *Tahoma*. All hands on the *Tahoma* were saved, but the vessel lies on an extensive reef with the decks just awash and is a total loss.

It is not surprising that the vessel struck an uncharted reef, for there are many such in Alaska; indeed the surprising thing is that our revenue cutters have navigated those waters for so many years with so few mishaps. In performing the duty of enforcing the law and the treaty for the protection of the fur seal and sea otter our vessels are forced to take many risks, since they must navigate with charts that are not only incomplete, but what is much worse, incorrect.

There are, of course, good charts of several of the harbors west of Unalaska which have been made at odd times by naval vessels and revenue cutters, but the general charts of the Aleutian Chain west of Unimak Pass are necessarily compiled from the only sources of information available, namely, the hasty and incomplete surveys of the early navigators. It is believed there is not a single island west of Unimak Pass correctly charted; the islands themselves are out of position; the coast lines are incorrect; and the soundings and outlying dangers are, for the most part, left to the imagination of the navigator. These facts, together with the ever present fog, make navigation in those waters a ticklish business, indeed, yet it must be done. To cruise a vessel in the vicinity of land under such conditions one must use extreme vigilance and prudence, and for the rest trust to the favor of Providence. In the experience of the writer several instances can be recalled where it was nothing but pure chance that his vessel did not strike an uncharted and invisible reef, the existence of which was discovered later.

The charts of the Alaskan coast east of Unimak Pass, while not by any means as correct and complete as the charts of the other coasts of the United States, are very good indeed compared with the charts of the coast west of Unimak Pass, and it was in this latter region that disaster befell the *Tahoma*.

Of course one can not be unmindful of the fact that there is at present practically no commerce west of Unimak Pass, and the further fact that with the exception of revenue cutters and an occasional trading vessel few American ships now sail those waters; nevertheless, this coast is a part of our territory, and with the prospective expansion of our commerce with the Orient there will undoubtedly be an increasing number of American vessels passing close to these islands while following the Great Circle course which takes them to Asiatic ports, and it would certainly seem that there is an obligation on the part of the Government to properly chart its own waters.

E. P. BERTHOLF.

OCTOBER 2, 1914.

Wrecks in Alaskan Waters.

If any further argument were needed to show the immediate necessity of further funds for the work of the Coast Survey in Alaska it should be found in the appended list, which is but partial, of accidents in Alaskan waters during the last 11 years. It should be recalled in reading it that during the latter part of this period navigation has greatly increased. The list includes no sailing vessels, of which many have been lost.

1903.—In August the steamer *Cyclone* was lost at Baron Koff Bay. Vessel was used as a lighthouse tender.

On November 1 the steamer *Discovery* was wrecked. Thirty lives were lost. Property loss about \$24,000.

1904.—On September 4 the steamer *Saidie* struck an uncharted rock off Cape York, Bering Sea, and sank. Estimated loss of property about \$80,000.

On November 23 the steamer *City of Seattle* struck an uncharted rock in Eagle River Harbor, Alaska. Was beached and temporarily repaired. Property damage about \$2,000.

1905.—On July 29 the ship *Star of Russia* struck on sand beach on Chirikof Island, Alaska. Was floated later and temporarily repaired. Estimated property loss about \$56,000.

1906.—On September 13 the steamship *Oregon* stranded on Hinshinbrook Island, Alaska coast, during heavy weather, and was a total loss. Estimated property loss \$150,000.

1907.—On March 19 the steamship *Northwestern* grounded on a reef at La Touche Island, Alaska. Damage \$35,000.

On May 25 the gasoline boat *Rita Newman* ran on the rocks at Simonefsky Island, Alaska, and was abandoned. The vessel was valued at \$27,000.

On August 1 the steamer *Ella* struck an unseen obstruction and was beached. The hull became a total loss. Property loss \$12,000.

On August 16 the steamer *Alice* struck a rock in Wrangell Narrows and sank. Was raised and temporary repairs made.

On October 16 the motor vessel *Iowa* grounded on Chilkat Island, Alaska. Estimated damage \$300.

1908.—On March 20 the steamer *Saratoga* grounded on a reef near Ellamar, Alaska, and became a total loss. Value of vessel \$150,000. Value of cargo \$28,000.

On April 16 the steamer *Tyee Junior* struck an uncharted rock. Damage estimated at \$1,000.

1909.—On April 30 the steamship *Columbia* stranded on Unimak Island, Alaska. Property loss estimated at \$75,000.

On July 14 the steamship *Ohio*, from Seattle to Alaskan ports, struck an uncharted rock in Tongass Narrows. The charts showed no soundings where she struck under 30 fathoms (180 feet). Note that it was in the Narrows where this vessel struck that 14 pinnacle rocks have been found this year which were hitherto unknown.

On September 13 the steamer *Uyak* struck on Walcott reef, Uyak Bay, western Alaska, and became a total wreck. Estimated value of vessel \$5,000.

1910.—On January 5 the steamer *Farallon* stranded on a reef in Iliamna Bay, Alaska, and became a total loss. Property loss \$40,000.

On April 11 the steamer *Georgia* stranded on an uncharted reef near Goose Island, Icy Straits, Alaska. Amount of damage \$1,050.

On November 12 the steamship *Portland* struck on or near Martin Islands, Katalla Bay, Alaska, and was a total loss. Estimated property loss \$75,000.

On December 10 the steamship *Olympia* stranded on Seal Island Reef, Alaska, and became a total loss. Loss \$120,000.

1911.—On October 7 the steamship *Edith* ran aground on the shoals off Level Island, Alaska, and was later floated. Damage \$25,000.

On December 13 the steamer *Zapora* stranded on Nesbitt Reef, Zarembo Island, Alaska, and was floated the same day. Damage \$7,000.

1912.—On May 20 the lighthouse tender *Armeria* struck on the rocks and was lost. Estimated property loss \$175,000.

On August 13 the steamship *Mariposa*, from Alaska ports to Seattle, struck an uncharted rock off Point Baker, in Sumner Straits, just west of where the chart shows 111 fathoms (666 feet).

1913.—On June 11 the steamer *Yukon* ran aground on reefs off Point Pitro, Sannak Island, Alaska.

On June 21 the steamer *Curacao* ran aground at Warm Chuck, west coast of Prince of Wales Island, and was a total loss. Property loss \$200,000.

On August 17 the steamer *State of California* struck an uncharted rock in Gambier Bay where charts show 12½ fathoms (75 feet) and became a total loss; 31 lives lost. Estimated property loss \$350,000.

On August 26 the steamer *Kayak* was wrecked off Ocean Cape, Yakutat, Alaska. Damage \$12,000.

On December 26 the steamer *Delhi* stranded. Damage about \$5,000.

The record for 1914 is incomplete but it contains the *Tahoma*, as above, and on October 5 the Steamboat-Inspection Service advised me as follows:

The Bureau is this day in receipt of report from the local inspectors at Juneau, Alaska, to the effect that on the morning of September 4, 1914, the steamer *Redondo*, while running up the unnamed bay on the western shore of Shuyak Island, east of Eagle Cape, at low tide, struck an uncharted rock near the middle of the bay, over which there was 6 feet of water at low tide. Soundings gave depths of 3 fathoms amidships and 4 fathoms astern. After remaining on the rock half an hour, the vessel was backed off with the rising tide, and made no water, and was put on the beach on September 7, where examination showed considerable damage to the bottom, extent of which has not yet been determined.

The photographs of 7 wrecks in Alaska, which are shown opposite this page, illustrate pictorially the dangers of Alaskan waters.

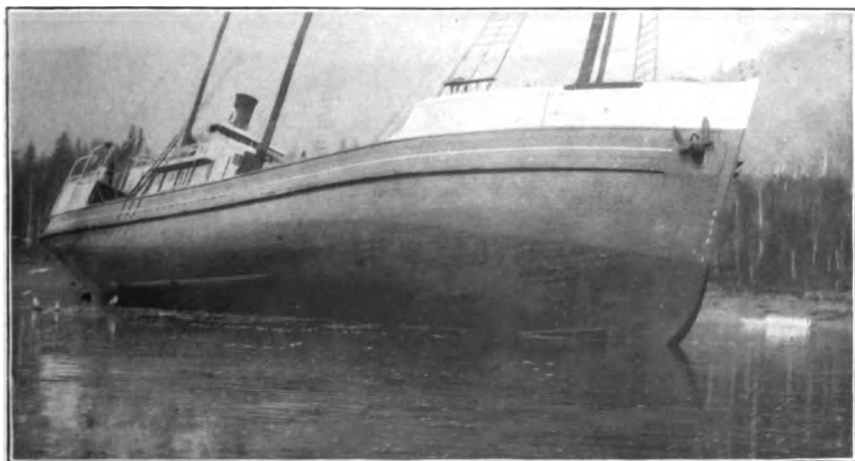
The records given above establish beyond all doubt the fact that many marine disasters, some attended by loss of life, have occurred on the coast of Alaska because the Government has failed to properly safeguard its commerce in those waters by adequate surveys and accurate soundings. In order to do three months' wire-drag work we will have to lay up steamers whose surveying work is urgently needed. The shortage of funds is such that both these necessary operations can not be carried on together. If one is done, the other to that extent must be left undone until Congress shall provide further funds.

Economical Use of Inadequate Funds.

Here may be raised a question as to the wise use by the Coast and Geodetic Survey of such funds as are appropriated for it. That there may be no doubt about the subject a schedule is appended of the use of these funds during the fiscal years ending June 30, 1913, and June 30, 1914, together with the proposed allotment for the use of the funds for the current fiscal year:



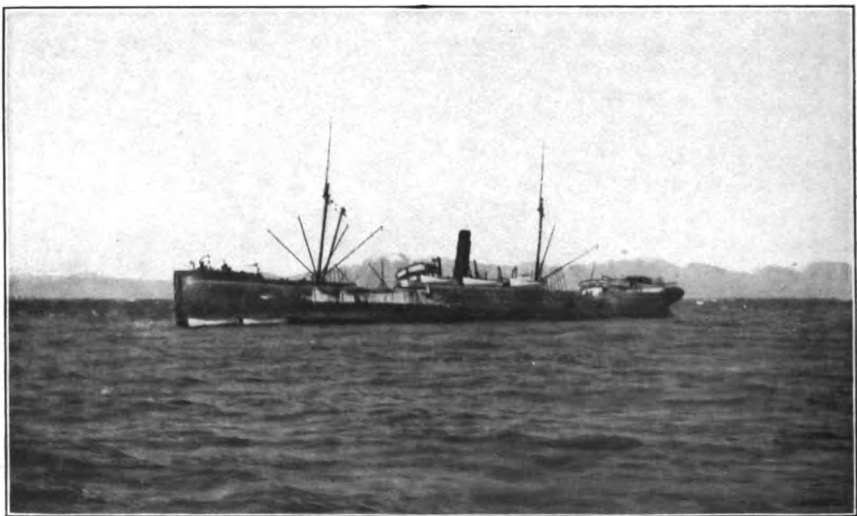
STEAMER "CITY OF SEATTLE," BEACHED IN EAGLE RIVER HARBOR, NEAR KETCHIKAN, ALASKA, AFTER HAVING STRUCK AN UNCHARTED ROCK.



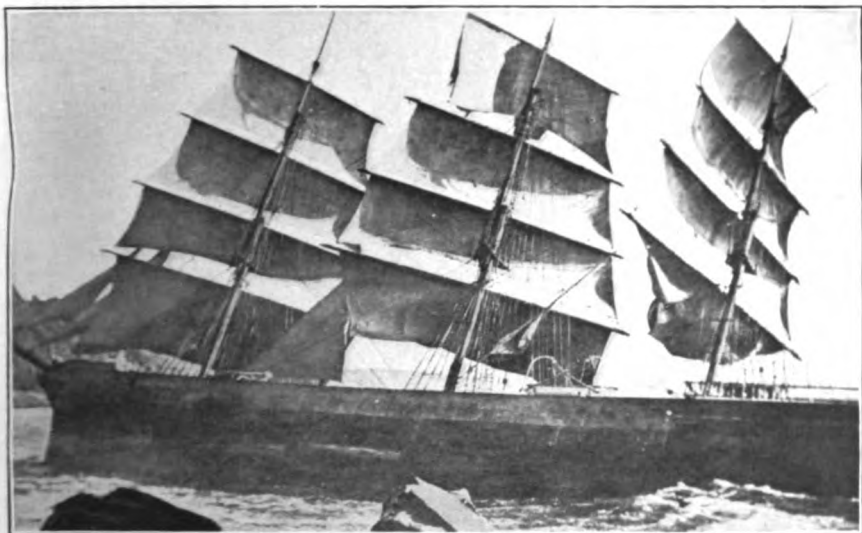
STEAMER "THOMAS L. WAND," ASHORE AT KETCHIKAN, ALASKA.



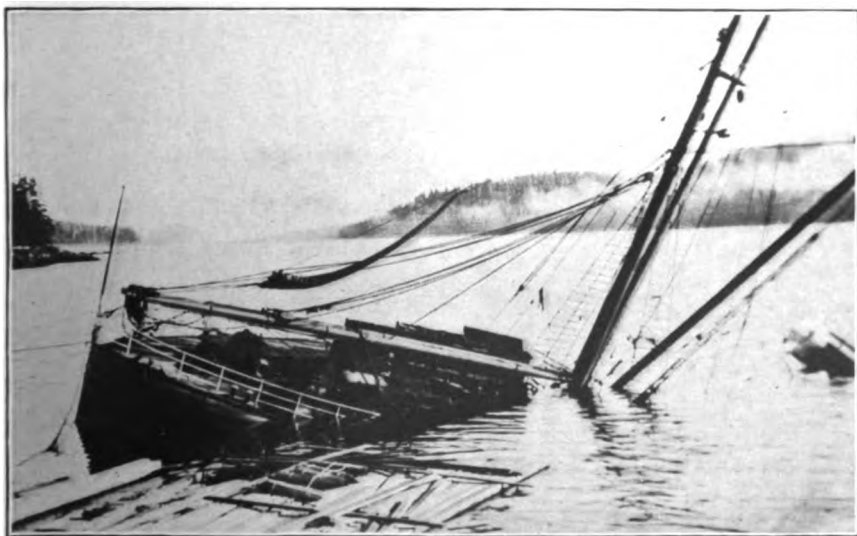
"CHARGER," AGROUND IN KARTA BAY, PRINCE OF WALES ISLAND, ALASKA.



STEAMER "OLYMPIA," STRANDED ON BLIGH ISLAND REEF, ALASKA.



"GLENESLIN," ON THE ROCKS NEAR NEAH-KAR-NIE MOUNTAIN, ALASKA.



"CURACAO," AGROUND AT WARM CHUCK, WEST COAST OF PRINCE OF WALES
ISLAND, ALASKA.



STEAMER "MARIECHEN," AGROUND IN FALSE BAY, ALASKA.

AMOUNTS EXPENDED UNDER THE APPROPRIATION, "PARTY EXPENSES," SUB-ITEM "PACIFIC COAST," FOR THE FISCAL YEARS 1913 AND 1914; ALSO THE AMOUNTS EXPENDED UNDER THE APPROPRIATION, "PARTY EXPENSES," SUB-ITEM "PACIFIC COAST," WITHOUT YEAR; ALSO AN ESTIMATE OF THE DISTRIBUTION OF THE APPROPRIATION, "PARTY EXPENSES," SUB-ITEM "PACIFIC COAST," 1915, INCLUDING THE ESTIMATED BALANCE UNDER WITHOUT YEAR.

| Party. | Nature of work. | Expended, 1913. | Expended, 1914. | Distribution of appropriation for 1915, including estimated balance under without year. |
|---------------------------------|---|--------------------|--------------------|---|
| ALASKA. | | | | |
| Steamer Explorer..... | Combined opera- tions. | \$20,361.51 | \$9,923.20 | Alaska, 7 months.. \$9,800 Outfit..... 2,000 Laid up, 5 months. 1,200 ————— \$13,000 |
| Steamer Gedney..... |do..... | 6,791.41 | 7,658.15 | Alaska, 7 months.. 4,700 Outfit..... 1,500 Laid up, 5 months. 1,000 ————— 7,200 |
| Steamer McArthur..... |do..... | 11,010.55 | 8,366.29 | Alaska, 7 months.. 4,700 Outfit..... 1,500 Laid up, 5 months. 1,000 ————— 7,200 |
| Steamer Patterson..... |do..... | 18,580.78 | 24,984.48 | Alaska, 5 months.. 14,700 Outfit..... 2,000 Laid up, 7 months. 2,000 ————— 18,700 |
| Steamer Taku..... |do..... | 6,209.75 | 6,217.82 | Alaska, 7 months..... 5,000 |
| Steamer Yukon..... |do..... | 6,383.95 | 8,290.47 | Alaska, 4 months..... 5,200 |
| R. P. Strough..... | Triangulation..... | | 606.02 | |
| J. A. Daniels..... | Wire-drag hydrog- raphy. | | 6,590.23 | Alaska..... 15,000 |
| PHILIPPINE ISLANDS. | | | | |
| Steamer Pathfinder.... | Combined opera- tions. | 20,350.43 | 23,725.00 | Philippine Islands..... 23,000 |
| Director of Coast Sur- veys. | Combined opera- tions, inspection, etc. | 64,502.07 | 62,606.00 |do..... 62,000 |
| HAWAIIAN ISLANDS. | | | | |
| E. R. Hand..... | Chart revision..... | 5,047.37 | 2,919.58 | Hawaii, 6 months..... 2,700 |
| PACIFIC COAST. | | | | |
| San Francisco suboffice. | Inspection, etc. | 982.88 | 1,012.54 | 1,200 |
| Seattle suboffice..... |do..... | 1,473.62 | 1,762.72 | 2,600 |
| Fremont Morse..... | Chart revision..... | | 904.09 | Shore party..... |
| J. W. Maupin..... |do..... | | 1,456.00 |do..... 2,400 |
| E. H. Pagenhart..... | Triangulation..... | 1,983.23 | 6,430.99 |do..... |
| G. T. Rude..... |do..... | | 411.00 |do..... |
| H. A. Seran..... |do..... | | 6,299.50 |do..... 4,800 |
| Miscellaneous outfit..... | | 711.45 | 535.79 | |
| Balance unallotted..... | | 611.00 | | |
| Total..... | | 165,000.00 | 180,699.87 | 170,000 |

DISTRIBUTION OF ALL AVAILABLE FUNDS FOR THE SURVEYS OF THE ENTIRE
PACIFIC COAST, ARRANGED UNDER PROJECTS.

| Locality. | Party ex- penses. | Tides. | Off- shore work. | State sur- veys. | Special surveys. | Objects not named. | Repairs of vessels. | Pay of officers and men. | Sal- aries, field. | Total. |
|-----------------|----------------------|--------|------------------------|------------------------|---------------------|--------------------------|---------------------------|--------------------------------|--------------------------|-----------|
| Alaska..... | \$71,300 | \$185 | ..... | \$2,755 | ..... | ..... | \$23,000 | \$119,200 | \$36,200 | \$252,640 |
| Philippines.. | 85,000 | ..... | \$2,280 | ..... | ..... | ..... | 5,000 | 55,000 | 26,000 | 173,280 |
| Hawaii..... | 2,700 | ..... | ..... | 3,500 | ..... | ..... | ..... | ..... | 3,500 | 9,700 |
| Pacific coast.. | 11,000 | 800 | ..... | ..... | \$3,500 | \$630 | 2,000 | 8,000 | 12,500 | 38,430 |
| Total..... | 170,000 | 985 | 2,280 | 6,255 | 3,500 | 630 | 30,000 | 182,200 | 78,200 | 474,030 |

The sundry civil act provides \$165,000 for surveys in Pacific waters during the current fiscal year, and a further sum of \$5,000 is available from an old continuing appropriation, making a total of \$170,000. The Superintendent of the Coast and Geodetic Survey states, respecting the provision of \$15,000 in the above schedule for a wire-drag party:

To keep it in the field for a greater period would be at the sacrifice of laying up all of the steamers during the spring season of the year, which would involve not only the loss of this valuable time, but also the expense during the time that the vessels were idle, which would be considerable and without any results.

It must now be considered whether any portion of the above fund of \$170,000 used under the technical heading "Party expenses, Pacific coast," which includes the operations of the steamers, can be transferred from its present use so that a larger amount can be spent in Alaska. First of all it should be said concerning this that if the entire amount were available for Alaskan work alone it would require many years to bring the original surveys to a close, for the coast line of Alaska is greater than that of the Atlantic, Pacific, and Gulf coasts combined and far more dangerous. We have never as yet sized up the job properly. We have gone at the matter on a scale as futile as the poor woman's attempt to sweep back the Atlantic with a broom. We put thirty millions into a railway to develop a growing national possession from which we have drawn hundreds of millions in value without providing the ordinary apparatus required to make surveys to insure safety in waters known to be dangerous by their continuing terrible record.

Can we, however, withdraw out of the \$170,000 that is available for the entire Pacific work some funds from their present uses and apply them to Alaska?

The only considerable item other than Alaskan work in the above schedule is that for the surveys in the Philippine Islands.

Should any part of this be transferred from use there and spent upon Alaska? Following a suggestion to this effect the Department has very carefully considered the subject. It was first studied whether the steamer *Pathfinder*, now operating in the Philippines, could be transferred to Alaskan waters. This is impracticable because—

First. The joint agreement between the Governments of the United States and the Philippine Islands, entered into with the approval of the Secretary of the Treasury, provided for—

The United States to maintain at least one of its large surveying vessels in the Philippine Islands and to pay the entire running expenses of this vessel.

The Philippine government has not only adhered strictly to its side of the agreement but has added 25 per cent to its stipulated contribution to the expenses of the surveys.

Second. The *Pathfinder* is the only available vessel for the work on the northeast coast of Luzon, where the work has to be done during the typhoon season, as the heavy sea along this coast during the northeast monsoon makes work at that season impracticable. This coast is almost uninhabited, except by wild tribes; harbors, of which little is known, are few, long distances apart, and impracticable of entrance during the thick weather which accompanies typhoons. A vessel for this work must be capable of putting to sea and weathering a typhoon if necessary. She must have large capacity for coal, oil, water, and general stores, as there are no sources of supply at hand. The *Pathfinder* alone of our fleet in those waters has these qualifications.

Third. The *Pathfinder* is the only vessel at our disposal adapted for service in other exposed regions distant from a base of supplies, or when the conditions are not sufficiently peaceful to warrant sending one of the smaller vessels.

Fourth. Since it would be impossible to ship a crew of Americans in the islands, the cost of bringing the vessel to the Pacific coast would have to include the return transportation of the Philippine crew to the islands. The American crew required on the American coast would add about \$14,400 and increased cost of coal about \$4,800 per annum to her operating expenses, or \$19,200 from our already inadequate appropriation for the Pacific coast work.

Pursuing the subject further, the Superintendent of the Coast and Geodetic Survey was asked whether \$30,000 could be transferred from the general fund allotted to the prosecution of the work in the Philippine Islands for the purpose of permitting

wire-drag surveys in Alaska. In response, the Superintendent submitted the following statement:

All the great nations are engaged in maritime surveys not only in their own countries but in foreign parts where the local governments do not carry on surveys or in ocean areas where there are no accurate surveys.

It is recognized that making maritime surveys is a duty which all civilized nations owe to the safety of life and property engaged in the world's commerce.

In accordance with the joint agreement between this and the Philippine government that the Survey should maintain one of its larger vessels in the Philippines, paying all its expenses, and as the only Survey vessel in the Philippines is the *Pathfinder*, it can not in good faith be withdrawn from there.

The withdrawal of \$30,000 can therefore only be accomplished by laying up the two steamers *Romblon* and *Marinduque*.

The following figures showing the result of such action are based on the actual expenditures for the fiscal year 1913, the only complete figures available for expenditures of the Philippine government:

| | Paid by United States: Party ex- penses. | Paid by Philippine Islands: Pay of crew, rations, clothing, repairs, etc. |
|--|--|---|
| Steamer Romblon accounts..... | \$14,856 | \$12,685 |
| Steamer Marinduque accounts..... | 12,571 | 16,937 |
| Amount paid by the Washington office and chargeable against party expenses for these two vessels..... | 1,072 | ..... |
| Reduction on account of less funds being required for traveling expenses for officers and employees between the United States and the Philippine Islands.... | 1,130 | ..... |
| Total reduction account party expenses..... | 29,629 | 29,622 |

The withdrawal of two of the five vessels employed in the Philippines would reduce the output 40 per cent.

It is evident that the withdrawal of \$30,000 by the United States would necessarily result in the withdrawal of an equal amount by the Philippine government, so that the progress of the survey in the Philippines would be hampered by a loss of \$60,000 now available for field work without any reduction in that portion of the overhead charges now borne by the United States.

Owing to the rapid progress that has been made in the surveys of the Philippines and the general satisfaction over the results that have been obtained to date, the importance of rapidly continuing the work in the unsurveyed regions of this locality should not be overlooked. The entire region off the north coast of Luzon, including the Babuyan Islands, Balintang Channel, the Batan Islands and Bashi Channel and thence across to Formosa remains imperfectly surveyed and is considered dangerous to navigation. By far the greater number of vessels that sail between the west coast of the United States and from Japan to the Philippines pass through this region. The entire locality about the island of Palawan and the Calamianes is very dangerous to navigation, while the existing charts are the results of only reconnoissance surveys and can not be safely used. The entire Sulu Sea requires careful surveying, as it is well known that numerous dangers to navigation exist, none of which have been located with sufficient accuracy to make navigation safe, while without doubt many dangers exist which have not been found. The entire region about Palawan and certain sections of the Sulu Sea is so dangerous that its navigation is forbidden by the underwriters, thus making it necessary for vessels navigating between southern island ports and Singapore en route to the Suez or to the west coast of Borneo and Sumatra to travel hundreds of miles from the most direct course which could be utilized if

properly charted. The approximate distances lost on this account are from Iloilo 200 miles, from Cebu 210 miles, and from Zamboanga 400 miles.

The following statistics are copied from the Report of the Philippine Commission for the year 1913:

"Total value of the foreign commerce, \$110,010,859.

"During the fiscal year 1913 there entered the Philippine Islands from foreign ports 794 vessels with a total tonnage of 1,831,212 tons, and there were cleared for foreign ports 781 vessels, representing a total tonnage of 1,868,811 tons. If to the above are added the coastwise entrances and clearances which some of these vessels made at ports in the Philippine Islands other than their principal port of destination, the total is 2,456 vessels, representing 5,073,533 tons."

In conclusion, I beg leave to state that a reduction of approximately \$30,000 in the allotment that has been available for the Philippine Islands would not only involve a loss in efficiency, the value of which is many times more than the amount involved, but there would be a real financial loss of many thousands of dollars due to the fact that much of the fund provided by the Philippine government would not be utilized and to the fact that overhead costs would practically remain unchanged.

It will be clear from the above that the local interests of the Philippines, the safety of our own national vessels, and our international obligations all require that the work in the Philippines shall not be interrupted and that the valuable cooperation of the Philippine government in it shall not be lost. The appropriation made by that government this year was secured with some difficulty because of the necessity on their part of reducing expenses, and was, by implication, conditioned upon the continuance of our own work on an undiminished scale. Since for lack of surveys vessels between Europe and Iloilo lose 200 miles distance, between Europe and Cebu 210 miles distance, and as regards Zamboanga 400 miles distance, the completion of the surveys would move the latter port $1\frac{1}{2}$ days nearer Europe for freight vessels and would bring the two former ones each almost a day nearer their markets. We should be justly accountable to the maritime world if we withdrew from the Philippine surveys while the entire region of the north coast of Luzon and thence across to Formosa, being the main route of travel from the north and east not only to the Philippine Islands but into the China Sea, remains imperfectly surveyed and is considered dangerous.

The Secretary of War wrote me as follows November 12, 1913:

For several years the government of the Philippine Islands has been appropriating approximately \$100,000 a year for the work of the coast survey of the islands.

This work has been carried on in an entirely satisfactory manner by the United States Coast and Geodetic Survey. In fact, the entire work mapped out is nearly 70 per cent concluded. It would be a misfortune if the work could not be carried on to a successful conclusion. On the other hand, it is almost impossible for the Philippine government to continue at this time to make this appropriation of \$100,000 a year.

Similar work in other dependencies is carried on by the United States without assistance from the governments thereof. In 1906 this matter was taken up and it was

then believed that it would be well for the United States to increase the appropriations for the Coast and Geodetic Survey so that the Survey might take over the entire expense of this work.

I hope that you can have the necessary amount included in your estimates for the approaching fiscal year. It would be a great accommodation to the Philippine government, as without suspending a very necessary work it would enable that government to make certain retrenchments which are absolutely necessary, without a bond issue, which it is at present hoped to avoid.

To this I replied November 17, 1913, as follows:

I have given careful attention to your kind favor of the 12th in the matter of the coast survey of the Philippine Islands. The subject has been taken up by me personally with Dr. O. H. Tittmann, Director of the Coast and Geodetic Survey, and as a result of such conference I beg to advise you as follows:

The Coast and Geodetic Survey is spending each year for service in the Philippine Islands approximately the sum of \$180,000 out of its own fund in addition to the appropriation from the Philippine government. I regret that it is impossible for us either to exceed that expenditure on our present appropriation or to ask for an increased appropriation for this purpose. This is because the circumstances of the work of the Coast and Geodetic Survey are such that our estimates for the fiscal year 1915 already show an increase over the fiscal year 1914 of \$728,240, or about 70 per cent. This arises in large part from the urgent need for additional vessels to complete the work on the coast of Alaska. This particular need is reinforced by the recent loss of three important vessels on that coast from uncharted dangers, viz, the *Armeria*, the *Curacao*, and the *State of California*, the latter with the loss of 31 lives.

Under these circumstances, while the Coast Survey will continue its present expenditure in the Philippines, the situation in those islands would be greatly changed if the Philippine government fails to add to the share it has heretofore granted. It will mean the withdrawing from service of three out of the five vessels now employed in the survey and the discontinuance of the geographic office in Manila, in which work I am told your office is especially interested. This would mean that the survey which might take 10 years normally to complete would undoubtedly be extended for 20 years or more. The condition would be the more grave since the waters requiring to be surveyed are the field of a considerable and an increasing amount of international commerce.

I earnestly hope, therefore, that it may be possible for the Philippine government to continue its appropriation so that the full force heretofore so successfully employed, and very largely of Filipinos, may continue in service.

The Philippine government made this appropriation and the work was continued. In this connection the War Department and the Navy Department have been recently consulted, since both are directly interested in the prosecution of the Philippine coast surveys, for they affect not only the safety of the local maritime commerce of the islands but the security of our transports and our vessels of war. They advise me as follows:

WAR DEPARTMENT,
Washington, October 5, 1914.

MY DEAR MR. SECRETARY: You have asked me if we can wisely and safely curtail the operations of the Coast and Geodetic Survey in the Philippine Islands by reason of the urgent demand for work in Alaska and, while I was prepared to answer immediately that I did not feel that the work of the Coast and Geodetic Survey in the Philippine Islands should be suspended or slackened, I thought it best to examine the

records with reference to this work and to give a more accurate statement than I could from memory.

It is needless to review the several reports which have been made of this work in the Philippine Islands further than to say that such reports show that the work has been uniformly commended by the Philippine authorities. The last report of progress now at hand shows that at the close of the fiscal year 1913 sixty-three per cent of the entire general coast line of the islands had been surveyed and that about 5.2 per cent represented the work accomplished in that year.

The cost of this work is borne in part by the Philippine government and in part by the United States Government. In that year, for example, the Philippine government expended slightly over ₱200,000.

In so much as the Coast and Geodetic Survey work is elsewhere carried on exclusively at the cost of the Federal Government, it has been hoped at times that the Federal Government would take over the entire cost of this work. It has not been possible to have this done, and the appreciation of the work by the Philippine government is shown by the continued appropriations therefor, even when the revenues of that government were falling below the expenses of the government. In the appropriation bill for the current calendar year in the Philippine Islands, while every effort was made to curtail expenses, there was the usual appropriation for the Coast and Geodetic Survey. It is believed that this action on the part of the government of the islands is the best evidence of the urgent need of this work in the islands.

While the interest of the Philippine government is largely due to the benefits of this work to commerce and the development of the islands, the work has been of great benefit to the Navy and in this Department to the transport service of the Quartermaster's Corps of the Army.

It is needless to add that any curtailment of the work or any suspension would simply mean a greatly increased cost for the completion of the work.

Very sincerely,

LINDLEY M. GARRISON,
Secretary of War.

The Honorable the SECRETARY OF COMMERCE.

THE SECRETARY OF THE NAVY,
Washington, October 8, 1914.

DEAR MR. SECRETARY: Replying to your inquiry as to the advisability of continuing to completion the hydrographic survey of Alaskan, Hawaiian, and Philippine waters, it is unquestionable, and the work should be completed for the safety of navigation.

In the Philippines, naval operations have been embarrassed because of the lack of complete survey, and vessels have grounded owing to the lack of sufficient surveys.

Sincerely,

JOSEPHUS DANIELS.

HON. WM. C. REDFIELD,
Secretary of Commerce, Washington, D. C.

The following statement from The New York Evening Post of October 17, 1914, reinforces the statement of the Secretary of the Navy quoted above:

Months of unremitting effort and unflagging patience have been rewarded finally by salvage of the gunboat *Princeton*, which, while returning from a surveying expedition to her berth in Pago Pago Harbor, American Samoa, ran full speed onto an uncharted rock, within gunshot of shore. Engineers had only the most primitive appliances to save the ship. Divers first covered the gaping rents in the *Princeton's* hull with canvas. By keeping their pumps working at top force, they were then able to make headway enough against the water to place plank sheathing. To top

their achievement, they separated a pinnacle of rock, which had pierced the *Princeton's* bottom, from the ledge of which it was a part, cemented it fast in the wound it had jabbed, and left it sticking there like a shark's tooth, torn from the jawbone of the ledge.

The Department is therefore forced to the conclusion that the work in the Philippine Islands is itself of such a character that it can not be safely interrupted or left undone at this time and that no funds can be withdrawn from its prosecution. Under these circumstances it will ask Congress for a sufficient further sum to permit keeping its vessels in operation throughout the year, to provide for the early building of new ships to take the place of the three which are antiquated and dangerous, and for the use of a wire-drag apparatus in Alaskan waters throughout the short season incident to that territory. It earnestly hopes that the cogent reasons that have been given will lead to the providing of the necessary funds. This will call for an increase of the appropriation for Pacific waters of from \$165,000 to \$225,000 and for an appropriation of \$500,000 for the construction of vessels.

The question was asked at a recent hearing before the Appropriations Committee of the House of Representatives on the estimates for the Coast and Geodetic Survey when its work would be completed. The answer must be that the work of the Coast Survey will be done when the currents of the ocean cease to flow, when the rivers cease to deposit along their channels and to form bars at their mouths, and after the necessity for further river and harbor improvements shall have ceased. So long as nature keeps up her submarine processes, the work of the Coast and Geodetic Survey will never be done.

It is obvious also that the great increase in draft of commercial and naval vessels and the opening of new harbors make necessary a revision of the early surveys in many localities and the extension of the detailed hydrography to greater distances from the shore. In the course of revising the Coast Pilot during August, 1914, a rock dangerous to navigation with 9 feet of water over it was found in the upper Hudson River and marked.

It will require 25 years at the present rate of progress to complete the preliminary surveys in Alaska alone, and there would still remain a large but indeterminable number of detailed surveys necessary for full safety to navigation.

Geodetic Work.

I have thus far spoken only of the coast survey work. It remains to speak briefly of the geodetic work of the Survey. This

includes the fundamental precision surveys to which all boundaries and land measurements are referred. It fixes the relation of our coast lines to each other, and serves as the fundamental basis of all chart and map making. This highly practical branch of engineering is required by the following organizations of the Government which use it constantly: The Engineer Corps of the Army, the United States Geological Survey, the General Land Office, the Reclamation Service, the Forestry Bureau, the Bureau of Soils, the Topographic Division of the Post Office Department, the Drainage Investigation Division of the Agricultural Department, the Valuation Division of the Interstate Commerce Commission, the International Boundary Commission, and several bureaus of the War Department.

This work is also utilized by the State boundary surveys, highway commissions and drainage commissions, and largely by railroads, consulting engineers, surveyors, physicists, and astronomers. It is constantly scrutinized by parties interested all over the world, both as to its cost and method.

In France, Commandant Perrier says of our geodetic work:

There is no example in the history of geodesy of a comparable collection of measurements made with so much decision, such great rapidity and such powerful means of action and guided by such an exact comprehension of the end to be attained.

Petermann's Geographic Magazine, the most famous of its kind, published in Germany, reviewing in 1913 our work on a new arc, says:

Worthy of remark is the accuracy attained in the measurements * * * but not less noteworthy are the great rapidity of execution and finally the small costs. In both of these last particulars probably it is not excelled by triangulation in any other land. This volume is a further noteworthy example of the untiring energy with which in the United States surveying and geodesy are carried on.

At the conference of the Surveyors General of New Zealand and Australia, in 1912, a geodetic survey under a Federal organization was recommended, with the statement that it should be conducted "on similar lines to those adopted in the United States Coast Survey, and, taking the coast line first, should be gradually extended inland."

The Surveyor General of India says:

I must thank you for your interesting chart of triangulation which I received with your letter of the 22d November, 1912. It is certainly an extraordinary piece of work, we have no means of working here with such rapidity. I see that your observers completed 103 stations in 200 days, including 17 observed azimuths and 2 bases. I am circulating the chart to our observers.

In 1909 at the meeting of the International Geodetic Association held in Cambridge and London the Americans were congratulated on having introduced a new epoch in geodesy.

Dr. Woodward, a distinguished geodesist and president of the Carnegie Institution, in an address before the Philosophical Society of Washington said that the work done on isostasy by the chief of the computing division of the United States Coast and Geodetic Survey "is the greatest contribution to geodesy since the time of Bessel and Gauss."

During July, 1914, 120 miles of precise leveling were completed on the line between Butte, Mont., and Pasco, Wash. The running of 120 miles of completed work constitutes a world record. The previous record, also established in this country, was 112 miles for one calendar month, and was made about eight years ago.

It is not easy to obtain the cost of work of this kind in foreign countries. We find, however, in the report of the Trigonometric Survey of India that one leveling party composed of 35 persons makes progress at the rate of 52 miles per month. In our Coast and Geodetic Survey one party of 6 men averages about 79 miles per month. The cost of precise leveling by other branches of this Government given by a standard work on surveying (1910) states the cost at from \$15 to \$32 per mile. It also gives the cost of French leveling at \$10 per mile and German at \$9.50 per mile. I present tables showing in detail, graphically and in figures, the steady increase in the efficiency of our geodetic work, as well as a condensed statement of the problem of the geodetic work required in the United States.

GEODETIC WORK—RATE OF PROGRESS FOR A SINGLE PARTY.

BASE MEASUREMENT.

| | | |
|-------------------|--------------------------|--------------------|
| Before 1899..... | No exact data available. | |
| 1899 to 1909..... | _____ | 19 days to 1 base. |
| 1909 to present.. | _____ | 15 days to 1 base. |

PRIMARY TRIANGULATION.

| | | |
|-------------------|--|---------------------|
| Before 1899..... | No exact data available; less than 20 miles per month. | |
| 1899 to 1909..... | _____ | 47 miles per month. |
| 1909 to present.. | _____ | 63 miles per month. |

PRECISE LEVELING.

| | | |
|-------------------|-------------------------------|---------------------|
| Before 1899..... | Less than 60 miles per month. | |
| 1899 to 1909..... | _____ | 68 miles per month. |
| 1909 to present.. | _____ | 79 miles per month. |

LONGITUDE.

| | | |
|-------------------|---|----------------------------|
| Before 1899..... | No exact data available; less progress than since 1899. | |
| 1899 to 1909..... | _____ | 2.3 differences per month. |
| 1909 to present.. | _____ | 2.2 differences per month. |

LATITUDE.

| | | |
|-------------------|--------------------------|-----------------------|
| Before 1899..... | No exact data available. | |
| 1899 to 1909..... | _____ | 4 stations per month. |
| 1909 to present.. | _____ | 8 stations per month. |

GRAVITY.

| | | |
|-------------------|--------------------------|-------------------------|
| Before 1899..... | No exact data available. | |
| 1899 to 1909..... | _____ | 2.9 stations per month. |
| 1909 to present.. | _____ | 3.4 stations per month. |

GEODETIC WORK—AVERAGE COSTS.

BASE MEASUREMENT.

Before 1899.....No data available.
 1899 to 1909.....\$130 per kilometer.
 1909 to present.....\$80 per kilometer.

PRIMARY TRIANGULATION.

Before 1899.....\$200 per mile.
 1899 to 1909.....\$66 per mile.
 1909 to present.....\$34 per mile.

PRECISE LEVELING.

Before 1899.....No exact data available, but more than \$16 per mile.
 1899 to 1909.....\$11 per mile.
 1909 to present.....\$11 per mile.

LONGITUDE.

Before 1899.....No data available.
 1899 to 1909.....\$435 per station.
 1909 to present.....\$462 per station.

LATITUDE.

Before 1899.....No data available.
 1899 to 1909.....\$170 per station.
 1909 to present.....\$125 per station.

GRAVITY.

Before 1899.....No data available.
 1899 to 1909.....\$325 per station.
 1909 to present.....\$245 per station.

PRIMARY TRIANGULATION AND PRECISE LEVELING IN A NUMBER OF COUNTRIES.

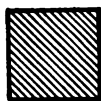
| Country. | Total area. | Per cent of area covered by primary triangulation. | Miles of precise leveling. | Miles of precise leveling per 100 square miles of area. |
|----------------------|-------------------|--|----------------------------|---|
| | <i>Sq. miles.</i> | | | |
| United States.....? | 3,970,000 | 12 | 31,000 | 1.0 |
| Alaska..... | 591,000 | 00 | 80 | .0 |
| British Isles..... | 121,000 | 200 | 12,804 | 10.6 |
| Austria-Hungary..... | 241,000 | 70 | 13,129 | 5.4 |
| France..... | 307,000 | 40 | 7,284 | 3.5 |
| Germany..... | 309,000 | 83 | 33,651 | 10.0 |
| Italy..... | 111,000 | 100 | 4,603 | 4.2 |
| Japan..... | 176,000 | 100 | 9,129 | 5.2 |
| India..... | 1,767,000 | 35 | 17,301 | 1.0 |

PRECISE LEVELS—DIAGRAM SHOWING THE NUMBER OF MILES OF PRECISE LEVELING PER 100 SQUARE MILES OF AREA FOR A NUMBER OF COUNTRIES.

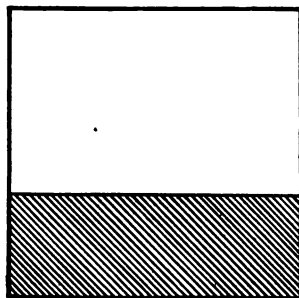
Germany.....16.0
 British Isles.....10.6
 Austria-Hungary.....5.4
 Japan.....5.2
 Italy.....4.2
 France.....3.5
 India.....1.0
 United States.....1.0 Needed now about 1.8.
 Alaska.....0.0 Needed now about 1.0.

PRIMARY TRIANGULATION DIAGRAM SHOWING PERCENTAGE OF THE AREA, OF A NUMBER OF COUNTRIES, WHICH IS COVERED BY PRIMARY TRIANGULATION.

[Scale: $\frac{1}{4}$ inch square = 48,500 square miles.]



Japan, 100 per cent.



India, 35 per cent.



Germany, 83 per cent.



Italy, 100 per cent.



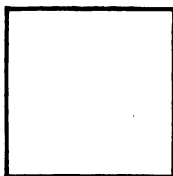
France, 40 per cent.



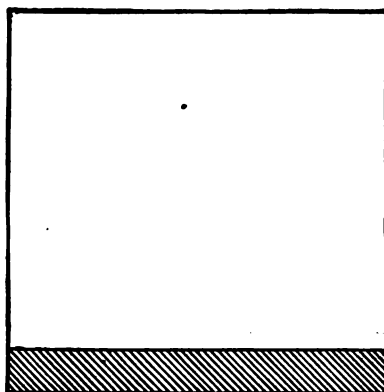
Great Britain, 100 per cent.



Austria, 70 per cent.



Alaska, 0 per cent.



United States, 12 per cent.

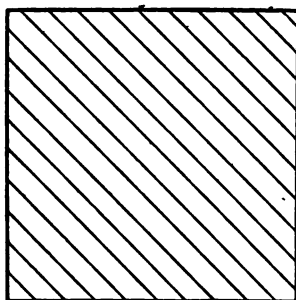
About 15 per cent should be done in the near future.

Between 20 and 25 per cent of the area should be covered as soon as possible to meet urgent needs.

PRECISE LEVELING DIAGRAM SHOWING, BY SHADING, THE NUMBER OF MILES OF
PRECISE LEVELING PER 100 SQUARE MILES FOR A NUMBER OF COUNTRIES.



Japan, 5.2.



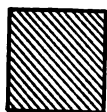
India, 1.



Italy, 4.2.



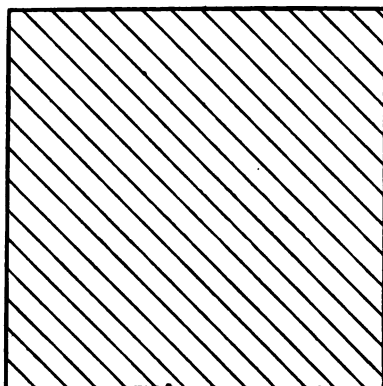
Germany, 16.



France, 3.5.



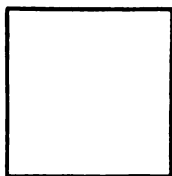
Great Britain, 10.6.



United States, 1.



Austria, 5.4.



Alaska, 0.

Several thousand
miles are needed
now.

The amount in the United States should be increased to about 1.8 miles per hundred square miles as soon as possible to meet urgent needs.

There are about 12,000 linear miles of primary triangulation in the United States. There should be added within a few years 9,000 miles more.

About 19,000 miles more of precise leveling should be done in this country for immediate use.

At the present rate of appropriation for geodetic work it would require over 30 years to do the above work.

The geodetic work done in this and in other countries is shown in the accompanying diagrams on pages 162 and 163.

There follows a statement of the estimates of this service from 1904 to 1915, inclusive, and the appropriations from 1903 to 1915, inclusive.

STATEMENT OF ESTIMATES FROM 1904 TO 1915, INCLUSIVE, AND APPROPRIATIONS FROM 1903 TO 1915, INCLUSIVE, OF THE UNITED STATES COAST AND GEODETIC SURVEY.

| Fiscal year. | Total for all purposes. | "Party expenses, Coast and Geodetic Survey." | | | | | | | | Other objects. |
|-------------------------|-------------------------|--|-----------------|----------------|-----------------------|----------------------|-------------------------------------|---------------------------------------|---------|----------------|
| | | Total. | Atlantic coast. | Pacific coast. | Physical hydrography. | Off-shore soundings. | Magnetic and geodetic observations. | Special survey for light-houses, etc. | | |
| APPROPRIATIONS. | | | | | | | | | | |
| 1903..... | \$828,525 | \$264,900 | \$70,000 | \$107,500 | \$5,000 | \$15,000 | \$50,000 | \$13,400 | \$4,000 | |
| 1904..... | 973,528 | 264,900 | 70,000 | 107,500 | 7,400 | 15,000 | 50,000 | 12,000 | 4,000 | |
| 1905..... | 849,625 | 264,900 | 70,000 | 107,500 | 6,400 | 15,000 | 50,000 | 12,000 | 4,000 | |
| 1906..... | 876,975 | 264,900 | 70,000 | 107,500 | 6,400 | 15,000 | 50,000 | 12,000 | 4,000 | |
| 1907..... | 848,915 | 257,900 | 70,000 | 107,500 | 6,400 | 15,000 | 50,000 | 5,000 | 4,000 | |
| 1908..... | 991,290 | 320,400 | 70,000 | 150,000 | 6,400 | 15,000 | 50,000 | 25,000 | 4,000 | |
| 1909..... | 996,290 | 325,400 | 70,000 | 160,000 | 6,400 | 15,000 | 50,000 | 20,000 | 4,000 | |
| 1910..... | 997,290 | 326,400 | 70,000 | 160,000 | 7,400 | 15,000 | 50,000 | 20,000 | 4,000 | |
| 1911..... | 996,790 | 320,400 | 70,000 | 160,000 | 6,400 | 15,000 | 50,000 | 15,000 | 4,000 | |
| 1912..... | 1,005,120 | 347,400 | 70,000 | 160,000 | 6,400 | 15,000 | 50,000 | 13,000 | 3,000 | |
| 1913..... | 1,022,720 | 314,400 | 65,000 | 165,000 | 6,400 | 15,000 | 50,000 | 10,000 | 3,000 | |
| 1914 ^a | 1,021,920 | 320,400 | 65,000 | 165,000 | 6,400 | 15,000 | 56,000 | 10,000 | 3,000 | |
| 1915 ^b | 1,045,720 | 320,400 | 65,000 | 165,000 | 6,400 | 15,000 | 56,000 | 10,000 | 3,000 | |
| ESTIMATES. | | | | | | | | | | |
| 1904..... | 972,325 | 264,900 | 70,000 | 107,500 | 6,400 | 15,000 | 50,000 | 12,000 | 4,000 | |
| 1905..... | 1,091,575 | 264,350 | 70,000 | 107,500 | 6,400 | 15,000 | 50,000 | 12,000 | 3,450 | |
| 1906..... | 858,575 | 264,900 | 70,000 | 107,500 | 6,400 | 15,000 | 50,000 | 12,000 | 4,000 | |
| 1907..... | 861,515 | 264,900 | 70,000 | 107,500 | 6,400 | 15,000 | 50,000 | 12,000 | 4,000 | |
| 1908..... | 1,134,365 | 399,250 | 70,000 | 227,500 | 6,400 | 15,000 | 50,000 | 26,350 | 4,000 | |
| 1909..... | 1,012,130 | 335,400 | 70,000 | 170,000 | 6,400 | 15,000 | 50,000 | 20,000 | 4,000 | |
| 1910..... | 996,290 | 325,400 | 70,000 | 160,000 | 6,400 | 15,000 | 50,000 | 20,000 | 4,000 | |
| 1911..... | 995,590 | 315,400 | 70,000 | 160,000 | 6,400 | 15,000 | 50,000 | 20,000 | 4,000 | |
| 1912..... | 1,041,800 | 340,400 | 70,000 | 160,000 | 6,400 | 15,000 | 75,000 | 10,000 | 4,000 | |
| 1913..... | 1,146,670 | 387,000 | 70,000 | 200,000 | 8,000 | 20,000 | 75,000 | 10,000 | 4,000 | |
| 1914..... | 1,191,895 | 412,000 | 89,000 | 200,000 | 8,000 | 20,000 | 81,000 | 10,000 | 4,000 | |
| 1915 ^b | 1,760,960 | 430,000 | 99,000 | 225,000 | 12,000 | 20,000 | 75,000 | 15,000 | 4,000 | |

^aSpecial appropriations for the fiscal year 1914 not included in statement: Alterations to buildings, \$12,500; damages, \$25.

^bThe estimates for 1915 also included \$18,600 for a lithographic press; \$2,400 for extension to lithographic building; and \$4,000 for a brick building for storage. The appropriations for 1915 embraced \$7,500 for rebuilding the lithographic and aluminum printing building, and \$5,000 for the erection of a one-story building.

STATEMENT OF ESTIMATES FROM 1904 TO 1915, INCLUSIVE, AND APPROPRIATIONS FROM 1903 TO 1915, INCLUSIVE, OF THE UNITED STATES COAST AND GEODETIC SURVEY—Continued.

| Fiscal year. | Repairs and maintenance of vessels. | Pay, etc., officers and men, Coast Survey. | Salaries. | General expenses. | New vessels. | Publishing observations. |
|-------------------------|-------------------------------------|--|-----------|-------------------|--------------|--------------------------|
| APPROPRIATIONS. | | | | | | |
| 1903 | \$29,600 | \$210,245 | \$282,780 | \$40,000 | | \$1,000 |
| 1904 | 43,603 | 210,245 | 282,780 | 50,000 | \$120,000 | 1,000 |
| 1905 | 29,600 | 210,245 | 293,380 | 50,500 | | 1,000 |
| 1906 | 54,600 | 210,245 | 297,230 | 50,000 | | |
| 1907 | 30,000 | 210,245 | 300,770 | 50,000 | | |
| 1908 | 40,000 | 245,000 | 335,890 | 50,000 | | |
| 1909 | 40,000 | 245,000 | 335,890 | 50,000 | | |
| 1910 | 40,000 | 245,000 | 335,890 | 50,000 | | |
| 1911 | 40,000 | 245,000 | 341,390 | 50,000 | | |
| 1912 | 40,000 | 245,000 | 352,720 | 50,000 | | |
| 1913 | 60,000 | 245,000 | 353,320 | 50,000 | | |
| 1914 ^a | 40,000 | 252,200 | 359,320 | 50,000 | | |
| 1915 ^b | 40,000 | 252,200 | 364,620 | 56,000 | 7,500 | |
| ESTIMATES. | | | | | | |
| 1904 | 29,600 | 210,245 | 296,580 | 50,000 | 120,000 | 1,000 |
| 1905 | 29,600 | 210,245 | 300,180 | 36,200 | 250,000 | 1,000 |
| 1906 | 35,000 | 210,245 | 298,430 | 50,000 | | |
| 1907 | 30,000 | 210,245 | 306,370 | 50,000 | | |
| 1908 | 52,000 | 281,245 | 350,670 | 51,200 | | |
| 1909 | 40,000 | 245,000 | 341,730 | 50,000 | | |
| 1910 | 40,000 | 245,000 | 335,890 | 50,000 | | |
| 1911 | 40,000 | 245,000 | 345,190 | 50,000 | | |
| 1912 | 40,000 | 245,000 | 366,400 | 50,000 | | |
| 1913 | 40,000 | 275,000 | 389,670 | 55,000 | | |
| 1914 | 40,000 | 275,000 | 392,370 | 60,000 | | |
| 1915 ^b | 40,000 | 275,000 | 385,760 | 56,000 | 525,000 | |

^a Special appropriations for the fiscal year 1914 not included in statement: Alterations to buildings, \$12,500; damages, \$25.

^b The estimates for 1915 also included \$18,600 for a lithographic press; \$2,400 for extension to lithographic building; and \$4,000 for a brick building for storage. The appropriations for 1915 embraced \$7,500 for rebuilding the lithographic and aluminum printing building, and \$5,000 for the erection of a one-story building.

It will be noticed that the last new steamer for this service was furnished 10 years ago.

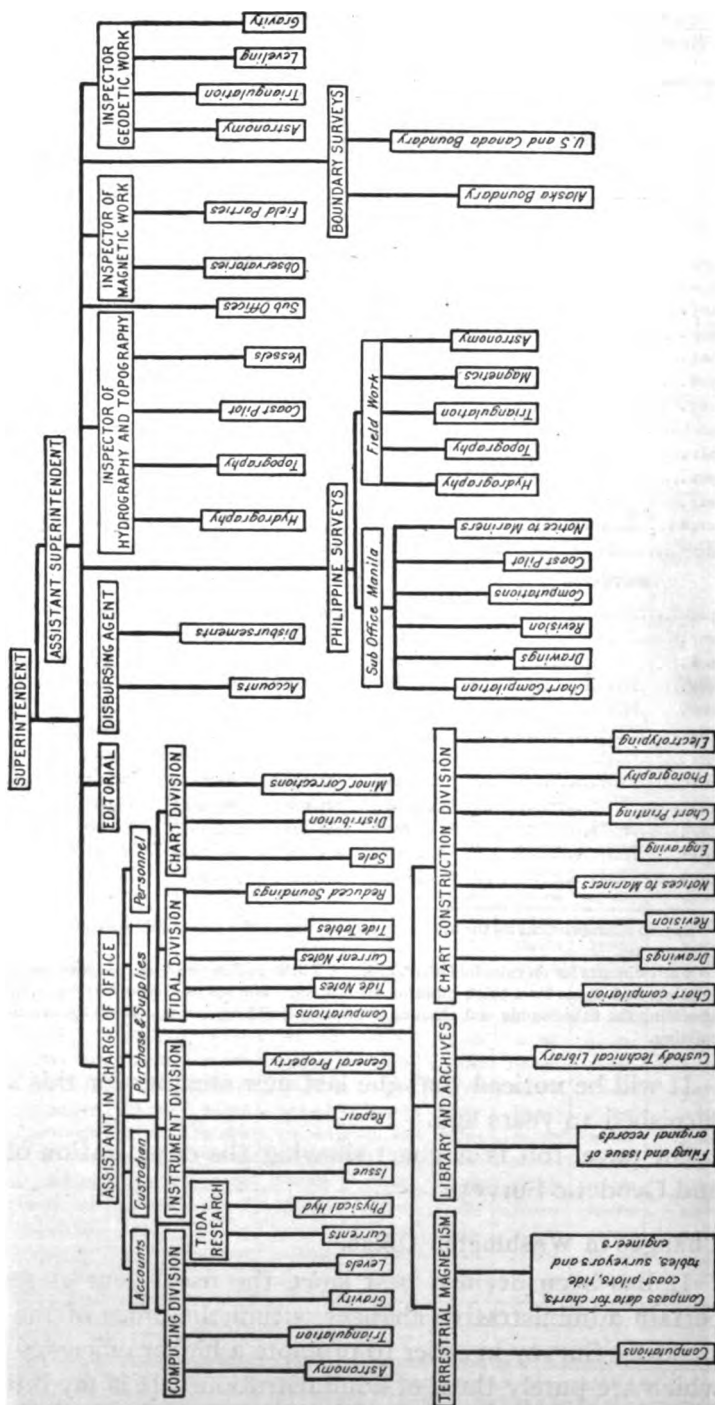
On page 166 is a chart showing the organization of the Coast and Geodetic Survey.

Changes in Washington Office.

It has been deemed best since the fiscal year closed to make certain administrative changes within the office of the Coast and Geodetic Survey in order to promote a higher efficiency in matters which are purely those of administration. It is my intention that

CHART SHOWING ORGANIZATION OF THE COAST AND GEODETIC SURVEY

1914



in every respect this work shall measure up to the high standard of achievement which the Survey has reached on its scientific side. The serious matters which have been raised, however, are not affected by matters of local administration, important as these last may be. It is not an answer to our crying need for ships and apparatus to be told that an office needs readjustment. Whatever office readjustments are required will be made and those who point to a definite need of such readjustments do a public service, but it does not account for the omission to do a major thing to say that a minor thing is or is not left undone. Either the matters which are above stated are facts or they are not. If they are facts, they call for an instant remedy for the bad conditions shown. If they are not facts, those who assert them not to be facts should show it. For the Department let me say that I will welcome, nay desire, the most searching inquiry, with the single proviso that what is found shall be made public and shall be the basis for action.

It would be easy to give further details in illustration of the position first above taken that this, the most ancient and one of the most important of the scientific branches of the Government service, has not received equitable treatment in the past.

Miscellaneous Services Performed.

During the past year a proposition has been made to the Department by the Post Office Department that all the work of lithographing maps for that Department be turned over to the Coast and Geodetic Survey. While this arrangement would be highly desirable and advantageous to the Government it can not be undertaken until Congress has made provision for additional lithographic presses and other machinery for which an estimate will be submitted.

Dangers developed in the course of the work of the Coast and Geodetic Survey are promptly reported to the public in the Notices to Mariners issued as a joint publication by the Coast and Geodetic Survey and the Bureau of Lighthouses. The results of important surveys on the coast of Alaska are now furnished to the persons most interested in the form of transcripts from the original sheets in advance of the publication of charts.

The results of the geodetic, magnetic, and tidal work are furnished to the public in the form of special publications.

In cooperation with the Bureau of Fisheries, and in accordance with the plans of the permanent international branch for the

exploration of the sea, an oceanographic cruise was made by the steamer *Bache* in the Atlantic Ocean and Gulf Stream from the Chesapeake Bay to Bermuda and the West Indies. While the work was primarily suggested by the Bureau of Fisheries for obtaining information governing the fisheries on the coast of the United States, the results are of equal interest and value to the Coast and Geodetic Survey as affecting navigation.

In spite of adverse weather conditions important and interesting scientific results were obtained which will throw much light on biological and physical conditions in the Gulf Stream and the Western Atlantic.

Incidentally, important improvements were devised in the apparatus used in deep-sea sounding.

The Superintendent of the Survey is commissioner on the part of the United States for the survey and demarcation of the boundary lines between the United States and Canada. The expenses of this work are paid from a special appropriation under the State Department.

During the past year the important and difficult work of surveying and marking the boundary line on the one hundred and forty-first meridian and the irregular boundary to the southeastward of Mount St. Elias between Alaska and Canada has been completed so far as the field work is concerned and the resulting maps are now in course of completion. The work on the northern and northeastern boundary between the United States and Canada and Lake of the Woods and between Maine and New Brunswick has made good progress.

In response to an invitation of the Imperial German Government Congress, in 1889, authorized the adhesion of this Government to an international convention for the admeasurement of the earth and directed the President to send a delegate to the next meeting of said International Geodetic Association. (26 Stat., 1019.) The body organized under this convention is known as the International Geodetic Association.

Again, in July, 1894, the President of the United States was authorized to appoint delegates to attend the meetings of the International Geodetic Association whenever and wherever the association meets. (28 Stat., 587.)

The United States has been an adhering member since 1889, and it agreed under the terms of the convention to a continuation of its adhesion for certain decennial periods, the last of which will expire December 31, 1916.

One of the undertakings of the International Geodetic Association was the establishment and maintenance of the International Latitude Service, and two special observatories have been equipped and maintained in this country since 1898, one in Maryland and the other in California. The Coast and Geodetic Survey supervises the work of these observatories.

Out of the funds contributed by all the signatory powers the International Geodetic Association spends \$4,000 a year on these two American observatories, and it also allows a subvention to an observer at the University of Cincinnati. About three years ago it appropriated \$2,500 for the construction of a photographic zenith tube which was built in this country and installed at Gaithersburg, Md., with which results of very remarkable precision and great importance have been obtained, as will appear when the final report is published.

This year the Foreign Affairs Committee of the House provided, in the diplomatic and consular act, for the usual annual contribution of the United States, amounting to \$1,500, but the Appropriation Committee of the Senate, which has jurisdiction, struck out the item. The Secretary of State recommended that the item be restored, but it was not done. The United States has thus failed to appropriate money to pay the dues for which it stands pledged. It is a matter of national honor to make this annual contribution. We have agreed to pay it and can not fail to make the payment without repudiating a national obligation. Furthermore, a much larger sum than our contribution is annually spent in this country by the body to whom the contribution goes.

Aside from the fact that all the great powers of Europe are cooperating for the maintenance of the International Geodetic Association, the adherents in the Western Hemisphere are Argentina, Chile, and Mexico. Canada, through the adhesion of Great Britain, is also a member, and the United States stands pledged until December, 1916.

In the appropriations for the Coast and Geodetic Survey a small item (not to exceed \$550) has been carried for the attendance of delegates to the meetings of the association held every three years. The delegates are officers of the Coast and Geodetic Survey. This item also was stricken out of the appropriation act for 1915. The amount involved is trifling and its restoration has been requested.

Field Work of Surveying Parties and Vessels.

In the geodetic work 25 stations were occupied for the determination of latitude at stations on the one hundred and fourth meridian by one party in two and one-half months. The points occupied were stations of the arc of primary triangulation along that meridian which had been established in previous years. The party engaged on this work used an automobile truck as a means of transportation and it is due to this chiefly that such rapid progress was made. A series of latitude observations was begun along the Texas-California arc of primary triangulation from the vicinity of Barstow, Tex., westward.

A reconnoissance for primary triangulation was completed for an arc of primary triangulation which will extend from the vicinity of the Salt Lake base northward to the Canadian boundary, a distance of 555 miles. Rapid progress was made in this work, the time occupied being only two months.

A reconnoissance was made for primary triangulation between Little Rock, Ark., through Oklahoma, to the ninety-eighth meridian. Lines of precise leveling were extended from Butte, Mont., to the Canadian border and from Crookston, Minn., to Bertholdt, N. Dak. This work was done with unusual rapidity, one party completing 100 and 101 miles and the other 99 and 105 miles run backward and forward in two months. The previous record had been about 70 miles per month. The use of motor velocipede cars in this work had much to do with the rapid progress made.

The difficult triangulation between the tertiary work in Oregon southwest to a junction with the tertiary triangulation in the vicinity of Redding Rock, Cal., was completed.

The triangulation along the coast of Washington between Grays Harbor and the Strait of Fuca was begun. This portion of the State had not previously had any geodetic control.

The important work of determining telegraphic difference of longitude to connect the Naval Observatory, Washington, D. C., and the Cambridge, Mass., Observatory, with a point near Far Rockaway, Long Island, N. Y., which place was to be connected by observers of the Prussian Royal Geodetic Institute with Borkum, Germany, by cable, was begun before the close of the fiscal year. Other work during the year were gravity observations at Washington, D. C., resulting in improved methods that will increase the rapidity of this work; the erection of signals for triangulation between Memphis, Tenn., and Huntsville, Ala.;

measurement of a base line at Cheyenne, Wyo.; and revision of triangulation and determination of geographic positions in various localities along the coast. The results of geodetic work are issued as special publications of the Survey.

Magnetic and seismographic observations were recorded during the year at magnetic observatories maintained by the Survey at Cheltenham, Md.; Tucson, Ariz.; Vieques, P. R.; Sitka, Alaska; and Honolulu, Hawaii. Magnetic observations were made in the field at a large number of stations in the United States and in the Hawaiian Islands and meridian lines were established when requested by local authorities. Observations were made at sea by vessels of the Survey in the course of surveying operations. Magnetic information was supplied in reply to a large number of requests from engineers, surveyors, and others interested.

Wire-drag examinations were made on the coast of Maine, in the vicinity of Matinicus Island, in the outer approaches to Penobscot Bay; in Buzzards Bay, Mass.; in the vicinity of the entrance to the Cape Cod Canal; in Duck Island Harbor of Refuge, Conn., between Menunketesuck Point and Hammonasset Point; and in the approaches to Key West, Fla.

The steamer *Hydrographer* was employed on the coast-pilot examination on the coasts of Connecticut, New York, and New Jersey, and in hydrographic surveys on the coast of North Carolina.

The steamer *Endeavor* was employed on the hydrography of the coasts of Rhode Island, North Carolina, and South Carolina.

The steamer *Bache* made hydrographic surveys at the entrance to Chesapeake Bay and was engaged in oceanographic examinations between the Capes of Virginia, Bermuda, and Habana, Cuba.

The schooner *Matchless* made hydrographic surveys in the East Branch of Elizabeth River, Va., and in the vicinity of Cape Charles, Va.

One party was engaged in a resurvey of Newark Bay and Passaic River, N. J., and another in revising the coast-pilot directions for the Potomac River.

Several parties were engaged in chart revision on the Atlantic coast, and an officer with headquarters at New York has acted as inspector for the section of the coast between Narragansett Bay and Delaware Bay.

On the Pacific coast the steamer *Gedney* was employed during the winter on a revision of the survey of Bellingham Bay, Wash., and a party was employed in a resurvey of Suisun Bay. A revision was also made of the survey of the water front at Seattle, Wash.

An officer stationed at Seattle was engaged in inspection duty on the coasts of Washington and Oregon and another with headquarters at San Francisco performed similar duty for the coast of California.

The steamer *Explorer* was employed in the survey of the approaches to the Kuskokwim River, Alaska, and in the survey of Icy Strait.

The steamer *Yukon* cooperated with the *Explorer* in the survey of the approaches to the Kuskokwim River.

The steamer *Patterson* was engaged in surveys in the Shumagin Islands in the vicinity of the Unimak Pass and search for the reported Leonard and Anderson Rocks, coast of Alaska, and during the winter season continued hydrographic surveys in the Hawaiian Islands.

The steamer *McArthur* was employed in surveys on the west shore of Cook Inlet, Alaska.

The steamer *Taku* was employed in surveys in Prince William Sound, Alaska, and made a special examination at the head of Passage Canal.

The steamer *Gedney* was employed on general surveys on the west coast of Prince of Wales Island, Alaska, including Bucarelli Bay, Klawak Inlet, Tonawek Bay, Sukwan Strait, and Mears Passage, Alaska.

An officer of the Survey, detailed to duty as director of coast surveys with headquarters at Manila, has direction of all field work in the Philippine Islands. The details of this work are mentioned elsewhere in this report.

The steamers *Pathfinder*, *Research*, *Romblon*, *Marinduque*, and *Fathomer* were engaged in that work. Of these vessels all except the *Pathfinder* are the property of the Philippine government, which provides the crews and keeps the vessels in repair. The salaries of the officers of all vessels are paid by the United States. The running expenses and outfit of the steamers *Romblon* and *Marinduque* are also paid by the United States. The running expenses and outfit of the steamers *Fathomer* and *Research* are paid by the Philippine government.

The steamer *Pathfinder* was employed on general surveys on the east coast of Mindanao and in the approaches to Manila Bay.

The steamer *Research* was employed in the region of the Samar Sea.

The steamer *Romblon* made surveys in the Calamianes and northern Palawan.

The steamer *Marinduque* was employed on the east coast of Palawan.

The steamer *Pathfinder* was employed in the Sulu Sea and vicinity.

Tide observations were made in connection with hydrographic surveys in the United States and its outlying territory, and at regular tide stations at Portland, Me.; Fort Hamilton, N. Y.; Atlantic City, N. J.; Philadelphia, Pa.; Baltimore, Md.; Key West, Fernandina, and Cedar Keys, Fla.; Galveston, Tex.; San Diego and San Francisco, Cal.; Seattle, Wash.; and Juneau, Alaska. Tidal indicators exhibiting automatically stage and height of the tide were maintained at Fort Hamilton, N. Y.; at New York City; and at Reedy Island, Delaware River.

Through the cooperation of the Bureau of Lighthouses current observations were made at a number of light vessels along the Atlantic coast. Similar observations were made when practicable by the hydrographic parties of the Survey.

STEAMBOAT-INSPECTION SERVICE.

Summary of Work.

During the fiscal year ended June 30, 1914, 318,094,347 passengers were transported on those vessels which are required by law to report the number of passengers carried. The total number of accidents which resulted in the loss of life during this period was 232, and the number of lives lost was 582, including passengers and crew, an increase over the previous year of 146. Of the total number of lives lost, 185 were from suicide, accidental drowning, and other similar causes, which leaves 397 which can fairly be chargeable to accidents, collisions, explosions, foundering, etc. The total number of passengers who lost their lives was 105, which is a ratio of 1 life lost for every 3,029,469 passengers carried.

The number of vessels inspected and certificated in the fiscal year 1914 was 7,930, with a tonnage of 9,970,510, a decrease of 35 in number, with an increased tonnage of 898,518, compared with the previous fiscal year. Of the vessels certificated 6,217 were domestic steamers, with a tonnage of 5,079,432, a decrease of 178 in number and of 30,137 tons; and 545 were foreign passenger steamers, with a tonnage of 4,374,006, an increase of 95 in number, and of 946,692 tons. Sail vessels and passenger barges to the number of 27 were inspected, with a tonnage of 12,734, a decrease of 6 in number and of 3,564 tons; and also 564 seagoing barges, of 473,318 tons, an increase of 7 in number, with a decrease in tonnage of 19,230. Five hundred and seventy-seven motor vessels, with a tonnage of 31,030, were inspected and certificated, an increase of 47 in number and 4,767 tons.

Licenses were issued during the year to 18,871 officers of all grades, a decrease of 7,611 from the preceding year. There were 4,829 applicants examined for visual defects, 61 of whom were rejected and 4,768 were passed. Compared with the previous year, these figures show a decrease of 2,841 in the number examined and 2,818 in the number passed.

At the various mills 3,159 steel plates for the construction of marine boilers were inspected, a decrease from the previous year of 49, and of this number 166 were rejected. In addition to these

plates, there were inspected at the mills a large number of steel bars for braces and stay bolts for marine boilers and also several hundred plates for stock and repair purposes. Many requests were received from other branches and departments of the Government for the testing of boiler material at the mills. These received the attention of the Service, and prompt reports were rendered to the proper officials.

During the year there were examined and tested at various manufactories 174,122 life preservers, of which 1,210 were rejected.

The total number of permanent positions in the Service at the end of the fiscal year was 265, consisting of 188 officers, 76 clerks, and 1 messenger. Three vacancies existed in the Service on that date.

Activities of the Service.

The Steamboat-Inspection Service, as its name partly implies, exists for the purpose of inspecting those vessels of the American merchant marine which are required by law to be inspected; licensing officers of merchant vessels; conducting investigations of casualties and violations of law coming under its jurisdiction; regulating the transportation, on water, of persons and articles, and making certain inspections for other departments of the Government. Each of these subjects will be taken up and discussed in its respective order.

Hull Inspection.

Under the rules of the Board of Supervising Inspectors, blue prints descriptive of the hull construction of vessels of over 100 gross tons are required to be filed with the local inspectors of the districts where such vessels are to be inspected, but it is not at present required that these blue prints be approved by such inspectors. Some thought has been given to the question of requiring that the blue prints be approved by the Steamboat-Inspection Service, but the Department is convinced that this approval should not be given by the local inspectors. It is believed that there should be stationed in the Office of the Supervising Inspector General experts whose business it would be to pass upon proposed hull construction. This is deemed necessary, first, to provide the Department the expert advice which the subject requires, and second, to bring about a uniform administration of the law, with which the Supervising Inspector General is charged.

To adopt this plan would, however, require the enactment of a statute that would give this express authority to the Steamboat-Inspection Service, and there would be required an appropriation for the employment of the experts. Furthermore, it would be a distinct departure from the principles that have heretofore governed the Steamboat-Inspection Service in the matter of the jurisdiction of local inspectors, in that it would transfer from local inspectors to the central office the responsibility of passing on the certain features affecting the seaworthiness of vessels. It is a matter which requires careful thought, and is not one to be adopted without full and due consideration, but it is a situation that faces the Steamboat-Inspection Service to-day, and which will, as time goes on, require more and more attention.

The Steamboat-Inspection Service inspects vessels in order to make travel by water safer. While much has been done to provide lifeboat and fire-fighting apparatus, the most important thing to do is to make the ship itself as nearly unsinkable as possible. Having done this, there should be placed on board the vessel the proper equipment to take care of those who travel on the ship, and the vessel should be properly manned.

The greatest danger on board ship is from fire, and it is believed that in order to follow out the principle of making the ship itself as safe as possible, before taking up the question of equipment, the Government should require that all excursion steamers be fireproof throughout. By some it may be claimed that it would not be practicable to make excursion steamers absolutely fireproof, as to do so would prevent them from being commercially profitable, but a contrary view has been entertained for a number of years by the Supervising Inspector General of the Steamboat-Inspection Service. In the annual report of that officer for the fiscal year ended June 30, 1905, it was stated that the inflammability of the ordinary type of river and excursion steamer was a matter that should have the fullest consideration of the Department; that while fire is one of the worst conditions that have to be met, and the most appalling in its results, little or no effort had been made to design these steamers upon any different plan than those which had been in use for years. It was pointed out in that report that paints, compositions, and various other compounds of a so-called fire-proof character had been suggested and tried, but none seemed to have served its purpose. It was also pointed out that there was at that time in course of construction in one of the prominent shipyards of the country a river steamer nearly 300 feet in length

that had been designed with a view to having her as nearly fireproof as utility would permit.

In the annual report of the Supervising Inspector General for the fiscal year 1906, the construction and operation of a fireproof excursion steamer was said to have proven successful beyond the strongest hopes of those who conceived this type of construction, and the opinion was advanced that Congress should enact legislation requiring fireproof construction on all excursion steamers thereafter built or contracted for.

In the meantime, in the absence of fireproof construction on excursion steamers, the best precaution that can be taken against the loss of life and property is to maintain the very best fire-fighting equipment on such steamers, and to have these crafts manned with excellently drilled crews who are competent to fight fire in the event that necessity arises therefor.

Until Congress requires fireproof construction of excursion steamers, it is believed also that the use of some such sprinkler system as is now installed on many passenger steamers should be extended.

Boiler Inspection.

Uniform administration of the law, with which the Supervising Inspector General is charged, can be attained, so far as boiler construction is concerned, only by requiring that all boilers used on vessels subject to inspection shall first be approved by experts in the office of the Supervising Inspector General. While the inspectors in the field service have heretofore done excellent work in this respect, we nevertheless live in a period of progress and the Steamboat-Inspection Service should be no less progressive than modern and effective business organizations. The law should therefore be changed so as to require the approval by the Supervising Inspector General of the design of these boilers.

During the past year the Steamboat-Inspection Service has made special efforts to see that actual internal examinations, so far as may be possible, are made of all boilers. The inspectors have given this matter their careful attention and the importance of the actual internal examination has been so impressed upon them that better work than ever before is now being done in this direction.

In the logical development of business and of administrative methods increasing attention is given to detail. Certainly this has been true of boiler inspection as made by the Steamboat-Inspection Service. For example, particular attention is now

given to fusible plugs, which is mentioned merely as an illustration of the extent of the detail of boiler inspection. But as the work becomes more detailed, the necessity has arisen for an additional number of boiler inspectors.

At present numerous orders are being given for repairs to boilers, and in districts where the pressure of work is not particularly great personal attention can be given by the inspectors to seeing whether these repairs are actually made; but there are districts where the pressure of work is exceedingly great, while the number of inspectors is relatively small, and in them it is impossible to give boiler repairs the attention which safe navigation would require. The fact is that the day of the affidavit is past, and the day of the actual "follow-up" system is at hand.

With reference to boiler inspection, attention is invited to section 4433, Revised Statutes, which has long since passed the period of its usefulness, and is no longer adequate to meet the conditions it was designed to govern. For the purpose of determining the working steam pressure allowable on marine boilers it was perhaps at the time of its enactment all that was necessary, but materials, construction, and methods of operation have changed so greatly that it can no longer be utilized to fairly determine working pressure. In its present form it takes into consideration only the value of the plate and the respective values of single and double riveted lap joints. No value is allowed any other rivet plan than these two, and single or double butt-strap joints, with rivet plan of any design, receive no consideration whatever in determining allowable pressure beyond that mentioned. An examination of the rules and regulations of the leading boiler insurance companies of this country will show that section 4433 is not consistent with the best modern practice, and should, therefore, be amended so as to provide that every boiler hereafter constructed of plates inspected as required by Title I, II shall be allowed a working steam pressure as determined by the rules of the Board of Supervising Inspectors. The enactment of a statute containing such a provision would give to the Board of Supervising Inspectors that discretionary authority for arranging for boiler construction that it should possess if it is to make its rules meet the best modern practice.

Motor Vessels.

The thorough inspection of motor vessels from Key West, Fla., to Eastport, Me., by the Department's vessel *Tarragon*, has con-

firmed the existence of conditions which were described in my annual report for 1913, as follows:

The extension of the steamboat-inspection laws to the 250,000 motor boats which are said to exist in the United States is probably unnecessary, and is certainly impracticable without a large increase of the inspection force and of appropriations. Nevertheless, the existing conditions respecting motor boats should not be allowed to continue. The Supervising Inspector General has frequently referred to the desirability of extending the inspection of motor boats.

The Department inspects the hull and machinery of all steam vessels over 65 feet long and limits the number of passengers to be carried thereon, except that it has no authority to control the number of passengers carried on steam ferryboats.

As the law stands, only such steam vessels under 65 feet long as are tugs and tow-boats are inspected. Steam vessels less than 65 feet long carrying passengers are not inspected, nor are the number of passengers on such vessels directly limited—both for lack of legal authority. If steam vessels between 40 and 65 feet long carry passengers, the Department approves the design only of their boilers and machinery. It can only control the number of passengers to be carried on such vessels under the present law by the indirect means of regulating the life-saving equipment.

The Department, however, has no direct power over a motor vessel either as regards passengers or machinery. It can inspect the hull, tanks, and piping, but only when the vessel is of 15 tons measurement or more, and when it carries passengers or freight for hire. If, for example, the motor vessel is a private vessel of over 15 tons measurement, the Department can not inspect her in any way. Even if she is a towing motor vessel of this size, there exists no lawful power to inspect her.

The Department can not limit the number of passengers carried for hire on a motor vessel, however big, except by fixing the life-saving equipment. Over motor vessels smaller than 15 tons the powers of the Department are limited to seeing them provided with the necessary life-saving equipment, lights, life preservers, and means of extinguishing gasoline fires. Here the present powers of the Government stop.

I wish to make this perfectly plain. If a Government inspector stands upon a dock watching a motor boat sail away with three times as many passengers as she ought to have and her machinery defective and her hull leaking, he would have no power in the premises, were she a motor boat under 15 tons measurement, except to see that there was a life preserver in good order provided for every passenger on board, that she had the proper lights and the proper means of extinguishing gasoline fires, with a whistle and a bell of standard dimensions. He could, indeed, require such a vessel to have a licensed operator, but for that license no examination is required. The powers of the Department in this matter should be extended. Every man whose pleasures or pursuits take him upon the water may see that motor boats are frequently loaded with passengers or pleasure seekers beyond the margin of safety. Every motor vessel used for carrying passengers should be inspected by the local inspectors of steam-boats and given a certificate of inspection. The examination need not be of such detail as that of a steamer, but it should be sufficiently thorough to assure the passengers and the public that such boats are in good condition. It should, however, further be provided that motor vessels may not transport passengers in excess of a fixed number, perhaps 20 or 25, unless such boats have been subjected to the full inspection prescribed for steam vessels, and unless those in charge of them have been licensed after examination in the same manner as corresponding officers on steam vessels. At present a person may obtain a license as operator of motor vessels without being a citizen of the United States or without being 21 years of age, and while being unable to read or write. Under the law, licenses to operators of motor boats are issued without any examination whatever. The inspectors of the inspection service are without authority to ask whether the person applying for such motor-boat license is color blind or whether he understands or can read the pilot rules. Yet such persons, having a

license so obtained, may, and in fact do, take charge of motor vessels carrying passengers for hire. Operators of motor boats should be required to show that they are not color blind and have good vision, that they can read the pilot rules and laws, and that they have a reasonable knowledge of them. The existing conditions are a menace to the lives of innocent and unsuspecting passengers and should not be permitted to continue.

The measures proposed could be carried into effect in a reasonable time and at a moderate expenditure of the public funds and would involve no hardship or undue restraint upon an important industry. The inspection would put the owner of the boat to no expense. The reckless navigation of an uninspected motor vessel jeopardizes the lives of passengers on inspected vessels, as well as those on the motor boat itself.

The numbering of motor boats for identification as automobiles are numbered is very desirable.

A bill to provide for the numbering of motor boats in an economical manner, involving the minimum of cost to the owners of these boats and to the Government, has already been sent to Congress by the Department.

Licensing of Officers.

In licensing officers of the American merchant marine, inspectors of the Steamboat-Inspection Service must regard not only the physical condition of those who apply for licenses, but also their mental equipment, to determine whether they are safe persons to intrust the navigation of vessels subject to inspection. The licensing of officers during the past fiscal year has been unusually extensive, and while at first the available supply of third mates was not large enough to meet the demand it is believed that now there is a sufficient number to man properly all vessels to which the law applies.

The so-called "seamen's bill," which is now before Congress, provides for certificating lifeboat men. While the bill requires the local inspectors to certificate these men and keep a list of the names of those to whom certificates are issued, it is also the plan of the Supervising Inspector General to maintain in the central office a complete list of all lifeboat men who receive certificates from local inspectors.

Transportation of Persons.

Measures which have been adopted to prevent overloading of passenger steamers were described in my report for last year. This is a matter governed largely by certificates of inspection, which limit the number of persons that may be carried. Special effort is made to detect overloading of passenger vessels after the issuance of the proper certificate. Inspectors are giving constant attention to the passenger-carrying allotment of passenger and excursion steamers, and the number of passengers permitted to

be carried now is relatively smaller than was permitted to be carried a few years ago. In any event, the original jurisdiction is placed by law in the hands of the local inspectors, and it has been impressed upon those officers that they will be held accountable for a strict performance of their duty in this respect.

During the past fiscal year there was put into use a new form for reporting on a card the number of passengers carried. As these cards were received in the Bureau they were carefully examined, and in every instance where it appeared that there was overloading, or a suspicion of it, the case received prompt and immediate attention. It is not steamers subject to inspection that violate the law or on which danger exists in the matter of carrying passengers; where danger exists is on motor vessels not subject to inspection and in some instances on motor vessels subject to inspection. In this connection attention is invited to the fact that under the present law there is no authority to restrict the number of passengers that may be carried on vessels other than steam vessels and for the purpose of correcting this condition it has been proposed that section 4464, Revised Statutes, be amended to read as follows:

SEC. 4464. The inspectors shall state in every certificate of inspection granted to vessels carrying passengers, other than ferryboats, the number of passengers of each class that any such vessel has accommodations for and can carry with prudence and safety.

It will be noted that the desire is to substitute the word "vessel" for "steamer."

Under present conditions the situation, as concerns motor vessels, is partly met by their equipment—that is to say, the vessels are boated according to the number of persons they carry—but it must be obvious to anyone that this is an attempt to control a dangerous situation by indirect methods, which are never satisfactory. Is it necessary that in order to eliminate the danger of carrying too many persons on motor boats there shall be some great catastrophe? In the light of the past, why is it necessary that this lesson should be brought home at such cost? Attention is called to this matter so that proper legislation to correct this very dangerous condition may be considered by Congress.

Transportation of Dangerous Articles.

Perhaps, in the effort to protect lives, the danger that exists from the transportation of dangerous articles is underestimated. The Steamboat-Inspection Service endeavors to control as much

as possible the transportation of dangerous articles on steamers carrying passengers, and while in some instances the Service has been conservative in this respect it is believed that it has acted on the side of safety, and in such a course public opinion will always support it.

Attention should be given to the extent of the authority of the Steamboat-Inspection Service over the transportation of dangerous articles on nonpassenger steamers. While from the commercial standpoint there are no passengers on these freight vessels, the Government nevertheless owes it to their crews to protect them. Further, the carrying of dangerous articles in a dangerous manner on steamers that are not carrying passengers endangers the lives of those on passenger-carrying steamers which are navigating in their vicinity. The jurisdiction of the Steamboat-Inspection Service should, therefore, be extended to the transportation of dangerous articles on nonpassenger steamers.

Extension of the Service.

Reference has been made to the extent to which the details of hull inspection have been developed; the extent to which the details of equipment have advanced; the attention which inspectors are required to give not only to the approval of blue prints of boilers but also to following up repairs that are ordered thereon. The desirability of extending the inspection of motor vessels has been pointed out. The importance of reinspections is very evident, but the inspectors of the Steamboat-Inspection Service have not in all instances been able to make all the reinspections or dry-dock examinations that are required. This is not the fault of the inspectors or of the system, but is due to the Service not having a sufficiently large number of men to perform its work.

It is useless to pass more exacting laws or for the Board of Supervising Inspectors to go into any greater detail in the matter of the Rules and Regulations until Congress shall have given the Steamboat-Inspection Service enough men to enforce the laws and carry out in an intelligent manner the rules that already exist. In some districts men are required to work from 5 o'clock in the morning until 10 or 11 o'clock at night. Such a thing should not be. Such a condition is wrong. A great and powerful Government such as ours should certainly provide a sufficient number of inspectors to properly perform these duties. If disasters occur as a result of lack of thoroughness, the responsibility will not rest upon the Steamboat-Inspection Service.

The importance of this matter should be clear to Congress, and, as already stated, it should not be necessary for a great disaster to occur before the necessary steps are taken to prevent further disaster.

If there is to be given to this Service the licensing of seamen, it is evident that the work of the field service will be substantially increased; and in order to centralize and have uniform standards for the approval in the office of the Supervising Inspector General of hull and boiler construction there must be a larger number of men in the central office.

The Steamboat-Inspection Service has a very excellent organization, as well as splendid systems that result in the fixing of responsibility, but systems are of no effect, and organization amounts to nothing, if sufficient men are not furnished to properly operate the machinery. The Steamboat-Inspection Service is so organized as to be capable of indefinite expansion, but it is to-day up to the limit of its endurance. The cry of the Service is for more men, and unless more men are furnished the proper standard of inspection can not be maintained.

Division of Districts.

During the past fiscal year a new board of local inspectors was established at Los Angeles, Cal. This was in accordance with legislation which permitted the district of San Francisco, Cal., to be divided, whereby two boards of local inspectors now cover the territory that was once covered by one, with the result that more prompt attention is given to the business of the Service and more detailed attention is given to inspection.

In the annual report of the Supervising Inspector General for the fiscal year ended June 30, 1913, reference was made to the need for dividing the first supervising inspection district, which at present comprises the local boards of San Francisco, Cal.; Los Angeles, Cal.; Portland, Oreg.; Seattle, Wash.; St. Michael, Alaska; Juneau, Alaska; and Honolulu, Hawaii. The supervising inspector in charge of this district is stationed at San Francisco. This one officer has under his jurisdiction the entire Pacific coast and a good part of the Pacific Ocean. He is a capable man, but it does not need any argument to convince one that the work of at least two men is being required of him, and that it is not possible for one man in such a district as this to give proper attention to all matters coming under his jurisdiction. The first supervising inspection district should be divided and a new district should

be created, to include the local inspection districts of Seattle, Portland, Juneau, and St. Michael, with a supervising inspector stationed at Seattle, Wash. Such an arrangement would leave in the old first district the local districts of San Francisco, Los Angeles, and Honolulu, with the supervising inspector stationed at San Francisco, Cal.

Summary of Proposed Legislation Affecting the Service.

It is believed that the system of issuing certificates of inspection should be changed. Apparently it is not necessary to furnish vessels with a large number of copies of certificates as required by present practice. The same purpose would be served if the local inspectors were to furnish the original certificate direct to the vessel and supply the collector or chief officer of customs with a copy. The result would be a saving in the number of copies of certificates of inspection to be made up, and the original copy would go to the master or owner of the vessel, which should always have been the practice. A recommendation that the law be amended in this respect is now receiving the consideration of the Department.

It is evident from what has already been said that the name "Steamboat-Inspection Service" is not a proper designation for this Service. Its activities are too varied to be designated by such a narrow term, and the necessary legislation will be requested to the end that the name may be changed to "Marine-Inspection Service."

Careful attention should be given to the drawing of a new motor-boat law. Such an act should be simply worded and easily understood, and contain every necessary provision to properly protect human life.

It is believed that section 4464, Revised Statutes, should be amended, as already pointed out, so that inspectors of this Service may have undisputed jurisdiction over the number of persons that shall be carried on vessels.

Section 4472, Revised Statutes, should also be amended so as to extend the authority of the Steamboat-Inspection Service, and invest it with jurisdiction over the transportation of dangerous articles on nonpassenger steamers as well as on passenger-carrying steamers.

Proper legislation looking to fireproof construction of excursion steamers should be enacted, and in the interest of good administration, legislative authority to divide the first supervising inspection district should be granted by Congress.

BUREAU OF NAVIGATION.

Tonnage of the Merchant Marine.

The total documented merchant shipping of the United States on June 30, 1914, comprised 26,943 vessels of 7,928,688 gross tons. This tonnage is the largest in our history, and it is gratifying to note that of the total 2,360 vessels of 1,066,288 gross tons are registered for foreign trade. During the year 1,151 vessels of 316,250 gross tons were built in the United States.

A sweeping change in our traditional maritime policy was effected by the act of August 18, 1914, which removed the restriction of American registry to vessels built in the United States and officered by American citizens. This change brings our laws in accord in these respects with the laws of Great Britain, Norway, and other maritime nations. While the passage of this act was hastened by the outbreak of the European war, it was in fact in the line of a manifest tendency for some years toward change in a maritime policy which had been outgrown and had hampered rather than fostered our progress on the seas.

Section 5 of the Panama Canal act of 1912 provided for the admission to American registry for foreign trade of vessels built abroad not more than five years old. Convinced that this age restriction would prevent the growth of our merchant marine as rapidly as the growth of our foreign trade permitted, in consequence of a more liberal tariff policy, I suggested in March, 1914, the removal of that restriction. A bill to give effect to this suggestion (H. R. 14661) was introduced on March 16, but was not acted on until August, when the need of such legislation was brought home to all by the sudden check upon ocean foreign trade and transportation for the few weeks immediately following the outbreak of war in Europe.

During the past 25 years considerable amounts of American capital have been invested in shipping under foreign flags. While there have been, of course, no exact figures available, it has been generally understood that American capital had built or controlled about 150 ocean vessels, aggregating about 600,000 gross tons, the owners of record of which were Belgian, British, or German subjects, and, in a few instances, of other nationalities. The law

forbade American registry to such ships, which were built abroad. Furthermore, the laws allowed none but Americans to act as officers on American ships. The act of August 18 removed these restrictions and thus enabled American property, continuously held in some instances for years, to assert truthfully its national character by the recognized national emblem and national papers at sea.

The second section of the act gave the President large discretionary powers, which were exercised in an Executive order issued on September 4. Between that date and October 15, 74 vessels of 267,240 gross tons were registered either at the customhouses or, in a few instances, provisionally by American consuls at foreign ports under forms and regulations agreed upon by the State Department and the Department of Commerce and based on established American and international custom and precedent.

The suspension for two years of the laws concerning survey, inspection, and measurement in the case of foreign-built vessels admitted to registration will afford the opportunity for the revision of such laws, wherever it may be found desirable in the interest of competitive navigation. A critical examination of those laws, however, will show fewer embarrassments arising from acts of Congress than many who have not read those laws are disposed to believe. The principal restriction designed in the interest of domestic shipbuilding has been permanently removed in the case of seaworthy vessels, and the requirement that foreign-built vessels must be certified as safe to carry dry and perishable cargo should not be repealed until the system of inspection has been reestablished.

The law requiring masters and other officers to be citizens of the United States, the second important restrictive feature of our navigation laws, has been suspended for a period long enough to enable us to determine its full effects. I am disposed to believe that in time it will enlarge the field of employment of competent American officers and engineers. Such, at all events, seems to have been the result when Great Britain enacted similar laws. The British act admitting to British registry ships built outside British territory was enacted in 1849, but with small results until in 1854, when Great Britain repealed the laws requiring the officers and crews of British ships to be British subjects. The Norwegian merchant marine has attained its development under similar liberal laws.

Navigation Receipts.

The receipts from tonnage duties last year were \$1,310,759.03, compared with \$1,273,789.43 the previous year, and are the largest annual receipts from this source in over 30 years. These duties are imposed without discrimination on vessels of the United States and vessels of foreign nations under reciprocal treaties entitled to equal treatment with vessels of the United States, and, consequently, are in no sense a handicap on American shipping. The rates imposed—6 cents per net register ton for five voyages during a year on over-sea voyages, and 2 cents on vessels arriving from foreign ports in North America, Central America, and the West Indies for five voyages—are appreciably less, as a rule, than corresponding charges levied in the ports of South America, Europe, Asia, and Africa. They are one of the lightest burdens we impose on foreign trade. During the current fiscal year the receipts from this source will be considerably reduced in consequence of our diminished foreign trade, owing to the European war.

The receipts from navigation fees during the year amounted to \$152,694.19, almost all of which was collected from vessels in foreign trade. The amount is insignificant in proportion to the value of our exports and imports, which aggregate over four billions of dollars annually. Whenever the balance sheet of our national receipts and expenditures permit, the Department will favor the abolition of these fees, which are collected in small amounts, usually less than \$5 in the case of any ship, and require, accordingly, clerical attention and a corresponding high cost of collection.

The collections from navigation fines during the year amounted to \$40,741.38. The increasing amount of these fines is due to the more effective enforcement of the navigation laws.

The receipts from the three sources named aggregate \$1,504,194.60. In addition to these annual revenues, the sum of \$446,870.50 was collected during the year under section 37 of the tariff act of 1909, imposing an excise upon foreign-built yachts owned by Americans. The Supreme Court of the United States in the case of *Billings v. United States* (232 U. S., 261) sustained on February 24, 1914, the constitutionality of the tax, and in its decision also required the payment of interest on the amounts due since 1909 but not collected pending the determination of the constitutionality of the law. This amount is an extraordinary receipt, and the section of the tariff act of 1909 under which it has

been collected was repealed by the tariff act of October 3, 1913. The repeal of the excise on foreign-built yachts accords in principle with the ship-registry act of August 18, 1914.

Shipping Commissioners.

Shipping commissioners at 15 seaports shipped, reshipped, and discharged during the year 378,772 seamen on vessels of the United States, a decrease of 416 compared with the previous year. The amount of salaries was \$63,475.20, an increase of \$1,101.07 over the previous year. In view of the necessity of the most rigid economy in all branches of the public service, the estimates for shipping commissioners provide for only one additional clerk at New York and New Orleans, respectively. The ship-registry act of August 18, 1914, will materially increase the work of shipping commissioners, as they must perform the duties with respect to the crews of the vessels transferred to the American flag formerly performed by foreign consuls. The registry act has been in effect for too short a time to permit any useful estimate of the increase in the work of shipping commissioners which it will entail, or to determine the ports where this work must be performed. The ships thus far registered, however, are engaged in trade mainly with South America and Central America, though the trade with Gulf ports will soon become more important. The opening of the Panama Canal will also contribute to the importance of these ports and will, of course, give added rank to Honolulu. From present indications it will be desirable another year to establish shipping commissioners' offices at Honolulu, Mobile, and possibly at Galveston. The successful operation of these offices is essential to our maritime development.

Radio Communication.

The work of the Bureau of Navigation in enforcing the laws relating to radio communication and the London International Radiotelegraphic Convention, proclaimed by the President on July 8, 1913, during the past year was practically double the work done during the fiscal year ended June 30, 1913. Ship inspections numbered 6,486, compared with 3,201 during the previous year. The number of stations licensed in accord with the international convention and with the act of Congress numbered 2,309. Examinations were held by the Bureau's inspectors of 2,245 applicants for licenses as radio operators, of whom 1,547 were found competent

and licensed. The increase in work of this service has been accompanied by a steady elevation in the standards of efficiency of apparatus and operators, and this relatively new branch of public service may now be regarded as on a firm basis. The increase in the volume of work has been possible only through the employment of low-salaried clerks, permanently or temporarily, to relieve of routine work the inspectors, who are men of scientific attainments, and enable them to devote nearly all their time to tests of apparatus and operators. A year ago the service was practically confined to New York, Baltimore, New Orleans, and San Francisco, but it was extended during the past year to 23 principal seaports and to 10 ports on the Great Lakes. It is gratifying to note that the general principles of our system of Government regulation of radiotelegraphy, namely, the compulsory equipment with radio apparatus of vessels carrying 50 persons or more and the maintenance of a continuous wireless watch and of auxiliary equipment, were adopted by the International Conference on Safety of Life at Sea, and when the international convention shall have been ratified the rules now applied to American ships in the interests of safety will be applied by all the maritime nations.

Both the voluntary and statutory use of radiotelegraphy is increasing rapidly, and for this reason there must be a moderate annual increase in the appropriations for the inspection service. Congress recognized this fact by appropriating \$45,000 to the service for the current year, and the estimates for next year call for \$47,525.

Some slight changes in the act to regulate radio communication, which will be submitted in detail later, should be made to accord with the London International Radiotelegraphic Convention, and changes in slight detail will be desirable to conform to the International Convention on Safety of Life at Sea. I deem it more important, however, that Congress should provide for some regulation of the rentals of stations on shipboard. Control over the rates for messages is now lodged in the Department of Commerce, and if for any reason the regulation of rentals should not be intrusted to this Department it might be assigned to the Interstate Commerce Commission or to the new Federal Trade Commission.

Enforcement of Navigation Laws.

During the fiscal year 1914, 6,720 violations of the navigation laws were reported to the Department through applications for the mitigation or remission of penalties, compared with 3,506

similar cases during the fiscal year 1913. The amount collected from mitigated fines amounted to \$40,741.38, the number of violations of law and the amount of penalties collected exceeding those of any previous year. This fact is not evidence of an increasing disregard for law, but of the more effective enforcement of the acts of Congress, which has resulted in safer conditions of navigation. It has been conclusively demonstrated that the most effective and economical method of enforcing these laws is through the employment by the Department of small vessels engaged exclusively in this work. The motor boat *Tarragon* during the year reported 1,762 violations of law and was operated along the entire Atlantic coast from Key West, Fla., to Eastport, Me., visiting practically all bays, sounds, and harbors, and ascending many of the rivers flowing into the Atlantic. The work of this boat is educational rather than punitive, and except in aggravated cases the penalties incurred for violations, many of which were first offenses, have been mitigated to nominal amounts. The Department has received from many sources testimony to the improved conditions in navigation which have resulted from the visits of this vessel. Congress has now provided for the purchase of another boat which will be used in conjunction with the *Tarragon* for Atlantic coast inspections. It is proposed during the coming winter again to make a thorough inspection of the vessels in the oyster fleet on Chesapeake Bay, on which about 3,500 men are employed. Two years ago such a visit by the *Tarragon* resulted in a marked improvement of the treatment of men aboard the oyster fleet, and in their quarters, food, and sanitary conditions. The abuses which had formerly existed practically ceased. A repetition of the visit is needed to preserve the good results already secured. The work done by the *Tarragon* is not only thorough but economical, the operating expenses during the year aggregating \$7,386.29, while the mitigated penalties already collected amount to \$4,905 with 331 cases remaining to be settled. Beyond operating expenses, \$3,305.60 was expended in new construction and extraordinary repairs mainly to adapt the vessel for service on the New England coast. Under ordinary conditions the amount of mitigated penalties collected from fines imposed in consequence of the inspections of a vessel of this type should meet all the ordinary running expenses.

Another method of enforcing the navigation laws is by the allotment to collectors of customs of small amounts for the hire of vessels for inspection purposes. In this manner, during the past

fiscal year, reports of 1,325 violations of law were secured. This method, however, is not wholly satisfactory, as it involves the employment of temporary inspectors who are not trained to the work, and as only small amounts can be allotted to each port systematic inspections are impossible. Since the reorganization of the Customs Service there has been a marked improvement in the work by customs officers under these allotments and it is proposed, if possible, during the coming year to extend this work, especially in ports where the navigation season is comparatively short and the purchase of vessels would not be warranted. During the year 768 cases of violations of the steamboat-inspection laws were reported to the Department, most of these violations involving a shortage in the licensed officers on the vessels. The work of enforcing the navigation laws has to do directly with safeguarding life and property on the water, and, as stated in my report of last year, I believe that a sum equivalent to the penalties collected for violation of these laws should be set apart annually for the use of the Department in extending its efforts to enforce them. The sum of \$30,000 asked for in the estimates this year for this purpose is \$10,741.38 less than the amount actually collected as navigation fines during the past fiscal year.

The following is a statement of violations of navigation laws reported by the various collectors of customs showing the laws violated and the work done by the Revenue-Cutter Service, the motor boat *Tarragon*, local inspectors of steam vessels, radio inspectors, and customs officers, the work of the customs officers under allotments made by the Department being shown in the last column of the second half of this tabulation.

| Port. | Total. | Steamboat laws (4399-4500, R. S.). | Motor-boat law "Rules of road." | Surrendered license (4325-4326, R. S.). | Bills of health (Feb. 15, 1893) ^a | Anchorage and St. Marys River rules. | Passenger act (Aug. 2, 1882). | Enrollment and li- cense (4336, R. S.). | Entry and clearance (2774-4197, R. S.). | Name on vessel (4178, R. S.). | Change of master (4335, R. S.). | Unloading. | Radio-communication laws. | Miscellaneous. |
|-----------------------|--------|---------------------------------------|------------------------------------|--|---|---|----------------------------------|--|--|----------------------------------|------------------------------------|------------|------------------------------|----------------|
| Baltimore, Md..... | 219 | 45 | 130 | 17 | ..... | ..... | ..... | 2 | ..... | 20 | 3 | 1 | 1 | ..... |
| Boston, Mass..... | 949 | 40 | 868 | 27 | ..... | ..... | 4 | ..... | 2 | ..... | 1 | 2 | 5 | ..... |
| Bridgeport, Conn..... | 134 | 7 | 104 | 18 | ..... | ..... | ..... | ..... | ..... | 3 | ..... | 2 | ..... | ..... |
| Buffalo, N. Y..... | 3 | 1 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 | ..... |
| Burlington, Vt..... | 54 | ..... | 54 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Charleston, S. C..... | 154 | 12 | 104 | 32 | ..... | ..... | ..... | ..... | ..... | 3 | 2 | 1 | ..... | ..... |
| Chicago, Ill..... | 105 | 14 | 82 | 6 | ..... | 1 | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... |
| Cleveland, Ohio..... | 90 | ..... | 66 | 15 | ..... | ..... | ..... | ..... | 3 | ..... | 1 | 5 | ..... | ..... |
| Des Moines, Iowa..... | 160 | ..... | 139 | 19 | ..... | ..... | ..... | ..... | ..... | 2 | ..... | ..... | ..... | ..... |

^a Bills of health cases transferred to Treasury Department July 24, 1911.

| Port. | Total. | Steamboat laws (4399-4500, R. S.). | Motor-boat laws "Rules of road." | Surrendered license (4395-4396, R. S.). | Bills of health (Feb. 15, 1903). | Anchorage and St. Marys River rules. Passenger act (Aug. 5, 1882). | Enrollment and li- cense (4316, R. S.). | Entry and clearance (3774, 4197, R. S.). | Name on vessel (4178, R. S.). | Change of master (4335, R. S.). | Unloading. | Radio-communication laws. | Miscellaneous. |
|-------------------------|--------|---------------------------------------|--|--|-------------------------------------|---|--|---|----------------------------------|------------------------------------|------------|------------------------------|----------------|
| Detroit, Mich..... | 112 | 4 | 75 | 8 | 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 5 |
| Duluth, Minn..... | 17 | 1 | 11 | 4 | | | | | | 1 | | | |
| Eagle Pass, Tex..... | 2 | | | 2 | | | | | | | | | |
| Galveston, Tex..... | 49 | 24 | 17 | 3 | | | 1 | 2 | 1 | 1 | | | |
| Honolulu, Hawaii..... | 15 | 1 | 3 | 1 | | | 1 | 4 | 1 | 4 | | | |
| Indianapolis, Ind..... | 1 | | | | | | | | | | | | 1 |
| Jacksonville, Fla..... | 669 | 20 | 517 | 85 | | | 4 | 16 | 10 | 9 | | | 8 |
| Juneau, Alaska..... | 41 | 5 | 2 | 23 | | | 5 | 2 | 2 | 2 | | | |
| Laredo, Tex..... | 14 | | 8 | 5 | | | | | 1 | | | | |
| Los Angeles, Cal..... | 79 | 6 | 53 | 9 | | | | 4 | 4 | 1 | | | 2 |
| Louisville, Ky..... | 41 | | 33 | 8 | | | | | | | | | |
| Memphis, Tenn..... | 10 | | 2 | 8 | | | | | | | | | |
| Milwaukee, Wis..... | 16 | 3 | 7 | 2 | | | 1 | 2 | | | | 1 | |
| Mobile, Ala..... | 157 | 4 | 115 | 32 | | 1 | 2 | 2 | | 1 | | | |
| New Orleans, La..... | 218 | 8 | 204 | 3 | | 3 | | | | | | | |
| New York, N. Y..... | 1,013 | 237 | 673 | 39 | | 13 | 5 | 5 | 17 | 6 | 2 | 11 | 5 |
| Norfolk, Va..... | 235 | 73 | 78 | 69 | | | | | 9 | 2 | 3 | | 1 |
| Ogdensburg, N. Y..... | 57 | 5 | 48 | | | | 3 | 1 | | | | | |
| Philadelphia, Pa..... | 378 | 55 | 265 | 37 | | | 1 | 12 | 3 | 2 | 2 | 1 | |
| Pittsburgh, Pa..... | 21 | 8 | 10 | 3 | | | | | | | | | |
| Port Arthur, Tex..... | 126 | 50 | 57 | 13 | | 1 | | | | 4 | | 1 | |
| Portland, Me..... | 78 | 10 | 50 | 10 | | | | | 3 | 4 | | 1 | |
| Portland, Oreg..... | 354 | 6 | 339 | 2 | | | 1 | 1 | | | | | 5 |
| Providence, R. I..... | 130 | 65 | 51 | 9 | | | 2 | 1 | | 1 | | 1 | 1 |
| Rochester, N. Y..... | 34 | | 34 | | | | | | | | | | |
| St. Louis, Mo..... | 109 | 3 | 79 | 17 | | | | | | 5 | 5 | | |
| St. Paul, Minn..... | 5 | 1 | 4 | | | | | | | | | | |
| San Francisco, Cal..... | 260 | 19 | 157 | 12 | | 2 | 5 | 4 | 18 | 10 | 21 | 11 | 1 |
| San Juan, P. R..... | 28 | 5 | 11 | 2 | | | 1 | | | | 4 | | 5 |
| Savannah, Ga..... | 98 | 18 | 59 | 4 | | | 1 | | 9 | 1 | 3 | 1 | 2 |
| Seattle, Wash..... | 381 | 10 | 248 | 86 | | 1 | 4 | 3 | 14 | 4 | 2 | 3 | 6 |
| Wilmington, N. C..... | 104 | 8 | 80 | 1 | | | 2 | | 7 | 2 | 4 | | |
| Total— | | | | | | | | | | | | | |
| 1914 (49 ports) *..... | 6,720 | 768 | 4,838 | 631 | 8 | 25 | 41 | 26 | 153 | 59 | 90 | 36 | 45 |
| 1913 (107 ports)..... | 3,506 | 333 | 2,783 | 23 | 23 | 8 | 24 | 10 | 83 | 26 | 1 | 40 | 152 |
| 1912 (105 ports)..... | 3,634 | 165 | 3,219 | 96 | 3 | 12 | 17 | 38 | 39 | 81 | 12 | | 52 |
| 1911 (92 ports)..... | 2,268 | 122 | 1,812 | 23 | 41 | 17 | 45 | 10 | 16 | 43 | 30 | | 50 |
| 1910 (74 ports)..... | 1,070 | 252 | 488 | 17 | 52 | 13 | 61 | 13 | 16 | 68 | 12 | 2 | 76 |
| 1909 (64 ports)..... | 1,134 | 151 | 710 | 33 | 69 | 3 | 21 | 14 | 7 | 59 | | 4 | 63 |
| 1908 (73 ports)..... | 852 | 245 | 385 | 12 | 42 | 6 | 21 | 23 | 18 | 30 | 7 | 2 | 61 |
| 1907 (66 ports)..... | 684 | 209 | 92 | 88 | 36 | 18 | 02 | 9 | 23 | 52 | 27 | 5 | 65 |
| 1906 (77 ports)..... | 670 | 194 | 130 | 114 | 41 | 13 | 27 | 10 | 6 | 49 | 5 | 9 | 72 |
| 1905 (63 ports)..... | 524 | 142 | 53 | 99 | 42 | 13 | 21 | 26 | 7 | 20 | 11 | 28 | 62 |
| 1904 (66 ports)..... | 706 | 184 | 93 | 101 | 48 | 49 | 16 | 29 | 12 | 24 | 19 | (b) | 131 |

* Reports are now made by subports through the principal port of the district.

† Included under "Miscellaneous" in 1904 report.

CASES REPORTED TO COLLECTORS OF CUSTOMS.

| Port. | By revenue cutters. | By Tar- ragon. | By local inspec- tors. | By radio inspec- tors. | By cus- toms officers. | Cases re- ported under al- lotments. |
|---------------------|---------------------|-------------------|------------------------------|------------------------------|------------------------------|---|
| Baltimore, Md. | 47 | 105 | 16 | 1 | 50 | 6 |
| Boston, Mass. | 66 | 112 | 22 | 3 | 746 | 257 |
| Bridgeport, Conn. | 14 | 14 | 3 | | 103 | 80 |
| Buffalo, N. Y. | 1 | | 1 | 1 | | |
| Burlington, Vt. | | | | | 54 | 54 |
| Charleston, S. C. | 53 | 59 | 4 | | 38 | |
| Chicago, Ill. | 69 | | 12 | | 24 | 81 |
| Cleveland, Ohio. | 24 | 1 | | | 65 | 41 |
| Des Moines, Iowa. | 73 | | | | 87 | 66 |
| Detroit, Mich. | 63 | 4 | 2 | | 43 | 10 |
| Duluth, Minn. | | | 1 | | 16 | |
| Eagle Pass, Tex. | | | | | 2 | |
| Galveston, Tex. | 4 | | 8 | | 37 | 8 |
| Honolulu, Hawaii. | 9 | | | | 6 | |
| Indianapolis, Ind. | | | | | 1 | |
| Jacksonville, Fla. | 3 | 477 | 9 | | 180 | 48 |
| Juneau, Alaska. | 2 | | 1 | | 38 | |
| Laredo, Tex. | | | 8 | | 6 | 8 |
| Los Angeles, Cal. | 11 | | 1 | | 67 | 47 |
| Louisville, Ky. | | | 1 | | 40 | 32 |
| Memphis, Tenn. | | | | | 10 | 2 |
| Milwaukee, Wis. | 9 | | 2 | 1 | 4 | |
| Mobile, Ala. | 2 | | 4 | | 151 | 113 |
| New Orleans, La. | | | 129 | | 89 | 202 |
| New York, N. Y. | 60 | 593 | 265 | 12 | 83 | |
| Norfolk, Va. | 8 | 43 | 73 | | 111 | |
| Ogdensburg, N. Y. | | 45 | | | 12 | 8 |
| Philadelphia, Pa. | 8 | 143 | 49 | 2 | 176 | |
| Pittsburgh, Pa. | | | 16 | | 5 | |
| Port Arthur, Tex. | | 16 | 6 | | 104 | |
| Portland, Me. | 38 | 2 | 6 | | 32 | |
| Portland, Oreg. | 37 | | 2 | | 315 | |
| Providence, R. I. | | 50 | 68 | | 12 | |
| Rochester, N. Y. | 2 | | | | 32 | 31 |
| St. Louis, Mo. | 5 | | 2 | | 102 | 75 |
| St. Paul, Minn. | | | | | 5 | 4 |
| San Francisco, Cal. | 168 | | 4 | 3 | 85 | 16 |
| San Juan, P. R. | 6 | | 4 | | 18 | |
| Savannah, Ga. | 12 | 17 | 1 | 1 | 67 | |
| Seattle, Wash. | 114 | | 5 | 3 | 259 | 136 |
| Wilmington, N. C. | 14 | 81 | 9 | | | |
| Total | 922 | 1,762 | 734 | 27 | 3,275 | 1,325 |

The foregoing statement of the work done by the various inspection services is based on reports made by collectors of customs on Cat. 1078 and is approximately correct. At Chicago, however, the allotment made by the Department was used by a revenue-cutter officer and that Service, as well as the allotment, has been credited with the results. At Galveston, Tex., Laredo,

Tex., and New Orleans, La., the local inspectors are credited with 145 cases, 137 of which were reported by a local inspector whose expenses were paid by an allotment. The statement of cases reported under the Department allotments necessarily is approximate only.

Passenger Act of 1882.

Especial attention has been paid during the year to the enforcement of the passenger act of 1882, and the Department is gratified to note that the steamship companies are cooperating with the inspectors in endeavoring to carry out the spirit as well as the letter of the law. During the year passenger steamers subject to the act, carrying 1,016,453 steerage passengers, made 1,797 entries in ports of the United States, which were subject to detailed inspections covering all the requirements of the law. The act itself looks to the health, comfort, and decency of those traveling in the steerage, and its importance has justified the Department in establishing a system of inspection which is more complete and thorough probably than under any other of the navigation laws. Vessels are boarded on arrival by two inspectors who not only see that the provisions of law have been observed, but passengers are questioned as to conditions which have obtained throughout the voyage.

General Anchorage Law.

The enactment of a general law to define anchorage grounds for vessels and enforce the observance of regulations is again recommended. A bill to carry out this purpose was passed in the Senate two years ago and by the House at the last session. Such an act is very desirable in the interests of safe navigation and commerce. The present law for New York Harbor vests authority in the Department of Commerce, but to my mind it is a matter of relatively little consequence by what department the general work is done, provided it be done effectively and economically.

Safety of Life at Sea.

The International Convention on Safety of Life at Sea, which embodies the unanimous recommendations of the international conference at London, was transmitted to the Senate by the President on March 17, 1914. I earnestly favor its ratification at the earliest practicable day. The scope of the convention and the method of its preparation were so clearly and concisely set forth

in the letter of the Secretary of State dated March 13, 1914, that I can not do better than to quote his words:

The convention embodies the unanimous conclusions of the International Conference on Safety of Life at Sea which met at London from November 12, 1913, to January 20, 1914. The conference was comprised of the representatives of the 14 principal maritime nations and of three of the self-governing British dominions. It was called in a large measure upon the suggestion of the Government of the United States, and the advice of the American delegation was influential upon a great many particulars which entered into this convention. The conference was composed of men trained to the sea and experienced in the administration of the laws relating to maritime affairs, and its unanimous conclusions carry weight on the matters of which the convention treats. The American delegates, who took an active part in the framing of every article and regulation of the convention, are agreed that the international standards for the safety of life at sea thus proposed to be established are higher than those of any nation now in force, and that the ratification of the convention will secure benefits for humanity by the joint action of maritime nations which could not be accomplished by any one nation, however powerful upon the sea. There are probably points in detail in which the convention may be criticized, especially by particular interests, but in its entirety it is high testimony to the will and ability of nations to put aside special and local considerations in order to promote the progress and welfare of mankind. By its terms the ratifications shall be deposited not later than December 31, 1914. Early and favorable action, accordingly, is recommended.

The convention was ratified by the German Reichstag in May, and the British Parliament in August passed the legislation to give effect to the convention. The Senate, I trust, will see its way clear to the unqualified ratification of the convention before December 31, 1914, for the United States should not be laggard in the prosecution of a work in behalf of humanity, in the inception of which our country had so large a share. The report of the commissioners of the United States to the conference was transmitted to the Senate on March 20, and explains in ample detail the provisions of the convention.

International Conference.

The International Conference for the Unification of Maritime Law, which was to have taken place this autumn at Brussels, was indefinitely postponed on account of the European war. The reappropriation of \$5,000 which Congress had made for American representation at this conference, accordingly, will not be used. The International Load Line Conference, which was to have taken place at London, has also been postponed, but the preliminary work for this conference on the part of Great Britain has not been discontinued, and the conference will be called at a suitable date. In view of the very large increase in ocean cargo steamers under the American flag, I deem it desirable that provision in due time should be made by Congress for American representation at this conference.

CONCLUSION.

A great deal is said in public discussion about extravagance in the expenditure of public moneys and the need for economy is repeatedly urged. Attention is directed usually to the mere total of appropriations in any one year, which means nothing whatever respecting the economical use of money. If attention were directed not to totals but to the wise use of funds so that the latter should be made to produce the utmost possible service, much would be accomplished that is now hardly suggested or attempted. Every industrial manager knows that economy requires his plant to be kept in the best productive condition. It is not economical, in order to save a total expenditure, to allow the plant to run down and then have to build it up again. This does not save money, but loses it. Economy of this kind is not economy at all. It merely involves a cycle of expensive changes, costly in themselves and more costly in their results. If, instead of arguing upon totals, without regard to whether the money which comprises those totals has been spent wisely or unwisely, care were centered on the need for expenditure and for the wisdom with which that need is met, money could be saved that will otherwise continue to be lost.

There are several distinct causes of loss of money to the Government to which but little attention seems to have been paid in public discussion of Government expenditure. One of these causes of loss arises from the failure to keep existing plant in operation to its full capacity. Such a case is that of the Coast and Geodetic Survey steamers laid up idle for part of the year while urgent work is waiting. Money thought to be saved in this way is not saved at all, but wasted.

Another cause of loss is the failure to keep the physical plant of the Government in good repair or to maintain it in effective condition. A case of this kind is found in the three old ships of the Coast and Geodetic Survey, on which an excessive amount of repair cost is required and which even with such outlay are not effective.

Another cause of money loss to the Government arises from incomplete appropriations, for example when funds are appropriated to do half the work required, thus necessitating the stop-

page of that work and causing greater expense from doing that work in several separate bits, with the incidental depreciation of the work already done before the second bite is taken at it. There is no saving in this process.

Another cause of money loss is the making of insufficient appropriations to procure apparatus suited for the work to be done. This arises when the Government is obliged to buy secondhand ships and adapt them to services for which they were not built. A case in point is the steamer *Gannet*, used by the Bureau of Fisheries, built for a private yacht and unfitted for the work she is called upon to do in the waters on the coast of Maine. The people of this country do not realize that the Government is forced to buy secondhand vessels because money sufficient is not given to get new ones, and they would not, in my judgment, were the facts known to them, approve the existing conditions.

Finally, money loss arises from failure to make appropriations in time to keep the work of the Government moving. The serious results of these latter losses are probably not appreciated. They undoubtedly amount to more than some of the economies thought to be effected by clipping estimates. There is no saving whatever but only loss in forcing the purchase of a secondhand vessel and the adapting it to a purpose for which it is not fit, while at the same time causing a cost of more than would build a new vessel by stopping important work for lack of having money in time to keep it going.

The uncertainty whether appropriations for the fiscal year ending June 30, 1915, would be made by or before that year opened caused, for example, the loss of nearly two weeks of the best season at the Beaufort, N. C., laboratory of the Bureau of Fisheries. In other words, the Government investment in this laboratory was idle for that time. The funds for the establishment of the Louisville and Orangeburg fish hatcheries being insufficient to complete their work and new appropriations being deferred, construction of those stations had to be suspended. This meant that the construction cost more to complete than it would have done had the work been carried on continuously and that there was an unavoidable depreciation in what had been done while waiting for further funds.

It has been customary in the fisheries service to send field parties out in June, but this year a number of them could not go until late July or early August. Here was a net loss of about one and

one-half months in time and a loss greater than actually appears, because in many cases time was not sufficient to complete the investigation, which means that the material and equipment must be reassembled next year and traveling expenses again paid to complete problems which under favorable conditions would have been finished in one season.

For research work at the laboratories of the Bureau of Fisheries in Woods Hole, Mass., Beaufort, N. C., and Fairport, Iowa, we depend upon professors from colleges, who are glad to give their services in the summer months for a nominal compensation. They, however, require materials and facilities. This season, by reason of the delay in the appropriations, one of the investigators upon an important problem refused to continue because of the uncertainty, and others have advised the Bureau that if similar conditions continue they will not be able to serve the Government.

In Alaska (see p. 97) it was impossible in 1914 to continue the investigations of the salmon run in Wood River. This run had been counted for several years to determine what proportion of fish in a given stream might be taken without endangering the food supply. It is important to have consecutive annual comparisons of these figures, and a break in the series impairs the value of years of work.

Another serious loss in this connection arises from the fact that all leases (of which the Bureau of Fisheries has some 15) expired on June 30 and could not be renewed during the period before the appropriations became available, and the Government was left to the mercy of the property owners.

The Commissioner of Lighthouses advises me that the delay of appropriations until after the end of the fiscal year operates—seriously to diminish the efficiency of the work, especially in connection with repairs construction, and supplies. The end of the fiscal year falls in the middle of the working season most advantageous for field work in most of the territory covered by the Lighthouse Service. When the appropriations for the following year are not then available except for short periods of time, it is impracticable to plan or carry out the field work in a comprehensive or efficient manner, and some of these necessary repairs involving larger amounts must be entirely deferred. The difficulty of making allotments from the appropriations when extended for brief intervals is seriously increased by the wide distribution of the work of this Service; such allotments must be made to district headquarters in Alaska, the Hawaiian Islands, and Porto Rico, as well as to 16 district offices within the United States. These brief extensions of appropriations also involve a material increase in clerical and accounting work throughout the Service, and they make it impossible to close any of the annual contracts for supplies for the Lighthouse Service.

An example of increased cost due to deferred appropriations occurred at the North Head Light Station, Wash., where the cost

of improving the buildings and grounds was increased approximately \$300, or about 30 per cent of the original estimate. The delay in the appropriation, and consequently in making allotments thereunder, required that this work be carried out at an unfavorable season at an increased expense.

The Director of the Bureau of Standards says respecting these same delays:

There was inconvenience, delay, crowding of work, and consequent loss of efficiency. The delay was mainly in placing orders for apparatus and technical materials, which require a long time for delivery, and also delay in making new scientific appointments which often take several months to secure civil-service lists. Uncertainty as to the granting of new or increased appropriations delays the definite planning of new work.

The Commissioner of Navigation states:

As the legislative bill did not become law until July 16, we were unable to get out allotments to collectors of customs for the hire of motor boats to be used in the enforcement of the navigation laws until after that date, thus losing over two weeks in the height of the motor-boat season. The resolution of Congress giving us one twenty-fourth of the total appropriation of \$20,000 for this purpose did not warrant us in making any allotments.

The urgent deficiency bill, carrying the appropriation of \$15,000 for navigation inspectors to count passengers, did not become law until July 29. From July 1 until about August 1, therefore, we were unable to use these inspectors.

It is not at all my purpose in reviewing the above facts to make a criticism but rather to point out methods of economy that are available if their importance is understood. Causes quite beyond the control of anyone may of course operate to enforce delay, and reasons may exist which are imperative for a procedure which is in itself expensive. It is proper, however, for the information of all who may be concerned that the relations of these things to that efficient administration of the public service which all desire should be made clear.

No sane business man would ever judge of economy or extravagance in expenditure merely by the total. He would ask, "Was the expenditure needed?" "Was the money well spent?" and he would not regard with tolerance or consider economical the mere absence of expenditure, especially when it involved him either in larger future outlay or in greater cost of operation.

Respectfully,

WILLIAM C. REDFIELD,
Secretary.

REPORTS
OF THE
DEPARTMENT OF COMMERCE

**BUREAU OF FOREIGN AND DO-
MESTIC COMMERCE**
BUREAU OF CORPORATIONS
BUREAU OF STANDARDS
BUREAU OF THE CENSUS
BUREAU OF FISHERIES

BUREAU OF LIGHTHOUSES
COAST AND GEODETIC SURVEY
STEAMBOAT-INSPECTION SERVICE
BUREAU OF NAVIGATION
APPOINTMENT DIVISION
DIVISION OF PUBLICATIONS

REPORT
OF THE
CHIEF OF BUREAU OF FOREIGN AND DOMESTIC
COMMERCE

REPORT

OF THE

CHIEF, BUREAU OF FOREIGN AND DOMESTIC COMMERCE.

DEPARTMENT OF COMMERCE,
BUREAU OF FOREIGN AND DOMESTIC COMMERCE,
Washington, September 14, 1914.

SIR: The following report of the work of the Bureau of Foreign and Domestic Commerce for the fiscal year ended June 30, 1914, is respectfully submitted:

The past year was made especially significant in the history of the Bureau through the development and presentation to Congress of far-reaching plans for the material expansion of the Bureau's promotive service, both at home and abroad. Recognition has gradually been won for the important duties of the office, and Congress has, in general, approved these plans and provided liberally increased appropriations to support the legitimate growth of its activities during the current fiscal year.

Efforts have been made to render as efficient as possible all the branches of the new Bureau, which was formed in August, 1912, by the combination of the former Bureaus of Manufactures and Statistics. There has been kept constantly in view its primary and essentially practical function of promoting trade. It is deemed that every detail of its service should be related as closely as possible to this purpose. For this reason special effort was made during the past year to spread a knowledge of the promotive value of all classes of the publications of the office, including the important statistical tables which constitute so large a part of its published product. Many changes have been made in the presentation of the various bulletins of the Bureau, and in some instances what is believed to be a more convenient form has been adopted for them.

The practical methods which the Bureau has endeavored to develop for the prompt and efficient distribution of trade information were utilized fully, and there is evidence that the publicity which it is so important to secure for this material is now greater than ever before. A vast volume of trade information flows into the Bureau from consular officers, collectors of customs, and commercial agents; and it is essential, in order to obtain the promotive effect which should attach to this information, to distribute it promptly and to make sure that it is transmitted direct to those commercial classes which are inter-

ested. Under the terms of the act making appropriations for the present fiscal year the equipment and personnel in Washington for handling and distributing this material will be greatly strengthened.

The files and indexes of the office have now been so developed that applicants for special information in any branch of commerce can be promptly supplied, not only with such reports as have been made by consular officers and commercial agents of the Bureau but also with the statements of imports and exports compiled in the statistical branch of the Bureau, and, in addition, with information compiled from yearbooks and official journals of foreign governments, from foreign and domestic trade papers, and from the many books on commercial subjects which are in the library of the office. The inquirer thus receives material which provides a perspective of the matter in which he is interested. A special section has been formed for research and translation, and this work will be developed to as high a standard of usefulness and efficiency as practicable.

A marked advance was made during the year in the system of handling the various reports and circulars prepared in the Bureau. Thousands of names of manufacturers have been added to the Bureau's card record known as the "exporters' index," and the names in this index now number about 12,000. Comprehensive lists, in card-index form, of both national and local commercial associations, of trade journals, commission houses, freight forwarders, steamship companies, and traffic officials of railways are now maintained. A classified card record of centers of industry in the United States where leading articles of manufacture are produced has also been established in connection with this system of effective distribution. These various reference indexes are made use of daily in sending out trade information. This trade information covers a wide range, including monographs relating to specific lines of trade, handbooks in regard to individual foreign countries, special statements of foreign custom tariff rates, semiweekly press letters describing the condition of our trade with foreign nations, confidential circulars setting forth trade opportunities, lists of foreign importers, photographic copies of documents (such as plans, specifications, and illustrations), marked copies of articles appearing in the Daily Consular and Trade Reports, and the "trade opportunity" notices which are issued in the latter bulletin. These indexes are also used in sending out notices describing the publications of the office which are sold by the Superintendent of Documents.

The specialized work of distribution has been assigned to a section of the office, with a clerk in charge and two assistants. There is still opportunity to extend this exporters' index, but it is believed that by the end of the current calendar year the list will be the most complete of its kind in the United States. It is found that this index, classified by industries and by countries in which the exporters are interested, is extremely useful in connection with the visits of American consular officers to the branch offices of the Bureau. The office is enabled to advise these exporting firms in advance of the visits of consular officers, the names of firms which are now transacting export business with the consul's district being immediately available in this office.

COMMERCIAL AGENTS.

The service of the "trade scouts," or commercial agents, of the Bureau has, as usual, covered almost the entire world. The trade investigations of these representatives of the Department of Commerce included studies of markets for canned goods in Asia by Mr. J. Alexis Shriver and in South America by Dr. E. A. Thayer. Mr. Shriver has also prepared reports on the pineapple-canning industry of the world and the tomato-canning industry of Italy, and Dr. Thayer, in South America, also made a careful study of the trade conditions relating to the export of drug products, patent and proprietary medicines, surgical instruments, and dental supplies. Mr. Ralph M. Odell continued his useful work on markets for cotton textiles through the Near East and down the East Coast of Africa to the Cape. Mr. Erwin W. Thompson completed his work on oil-seed products in Europe and Mr. Frank G. Bolles closed his reports on by-products of coke ovens and on electric furnaces.

The list of publications given elsewhere in this report will indicate the range and the interest of the special reports which have resulted from the work of these agents. As far as practicable, commercial agents have, upon their return to the United States, visited trade centers and, by personal meetings and by public addresses, materially enhanced in this very practical way the promotive value of their work. A number of important national commercial associations have passed resolutions commending highly this branch of the service of the Bureau, and have testified to the practical impetus and aid that it gives to our export trade. No doubt, of course, can now exist with respect to the usefulness of first-hand observations of the facts in connection with special branches of our foreign trade by technically trained agents and experts. It is felt advisable here again to recommend strongly that as far as practicable this service be provided for in the estimates of the coming fiscal year on a statutory basis. It does not seem possible that a great exporting nation like the United States should ever discontinue this work, which has so fully proven its value, and it would be of definite advantage to the Bureau to establish a statutory basis for the employment of these commercial experts.

This is particularly important in view of the fact that the Bureau, during the year, has stationed these agents in several important commercial centers, including New York City, Chicago, San Francisco, and New Orleans, where they are rendering most efficient and valuable service in making commercial investigations of importance to the Bureau and in extending the practical promotive value of its publications. These agents are enabled to make promptly such current investigations of trade conditions in the districts which they serve as may be directed by the head of the office, and are provided at their headquarters with the publications, trade lists, directories, files, and other material which equip them to aid business firms in the most practical way. The service has already justified itself so thoroughly and completely that since June, 1914, similar branches have been established in Boston, Atlanta, and Seattle.

COMMERCIAL ATTACHÉS.

In the estimates for the fiscal year 1915, an important extension of the foreign trade promotion work of the Bureau was recommended to Congress. A fund of \$150,000 was requested, this fund to be used to establish in the various capitals of the world a corps of commercial attachés, who should very greatly supplement and strengthen the present system of collecting trade facts for the benefit of our export commerce. This recommendation has received the approval of Congress, and \$100,000 has now been made available. This will permit the early appointment of 9 or 10 commercial experts, who will be dispatched promptly to Europe, the Orient, and Latin America, where they will institute a service of commercial promotion of a character which, if efficiently performed, can not fail to be of great importance and value in the development of our over-sea trade. With a semidiplomatic status, free to travel in the country to which he is assigned, with no duties other than those of trade promotion, the commercial attaché may develop a service which the consul, with his many other deterrent duties, can not undertake. The commercial attachés will work with the consular officers under such joint regulations by the Department of Commerce and the Department of State that no friction or duplication of service will occur.

This gives us a complete and well-rounded system of trade-promotion service abroad, comparing favorably with that of any other nation.

DIVISION OF STATISTICS.

With a special view to the simplification of methods, the use of the printing fund of the office to the best advantage, and the elimination of duplications of published statistical statements or tables of doubtful promotive value to the commercial public, many modifications were made in the work of the division of statistics during the fiscal year just closed. Where statistical tables have heretofore been published in several of the periodical issues of the office, when practicable only a single issue has been authorized. Table 19, "Imports and exports of the United States by principal articles and countries," has been omitted from the large annual report or volume Commerce and Navigation of the United States and issued as a separate bulletin in octavo form under the title "Trade of the United States with the World."

The size of the Monthly Summary was somewhat reduced by omitting the tables of "Wholesale weekly prices of leading articles in the United States markets" and "Receipts and prices of cattle and hides in Chicago." Tables showing the commerce of principal countries, and the financial tables taken from statements published by the Treasury Department, were greatly condensed. The calendar-year statements heretofore printed in the December Summary were also omitted. Beginning with the issue for July, 1914, the name of this publication was changed from "Monthly Summary of Commerce and Finance of the United States" to "Monthly Summary of the Foreign Commerce of the United States."

As there has developed quite a demand for import and export figures by months for a series of years, mostly in connection with

tariff discussions, the advisability of issuing a special bulletin covering this record will be considered at the proper time.

The monthly total value sheet of imports and exports was ordered discontinued by the Department for December, 1913, and January, 1914, but was reestablished for February, 1914, and has been issued regularly since then. The demand for this publication seems to justify its continuance.

The monthly bulletin of Exports of Domestic Breadstuffs, Meat and Dairy Products, Cotton, etc., from Principal Customs Districts was reduced from 12 to 4 pages by omitting the detailed figures by districts for the accumulated periods.

The annual volume Commerce and Navigation was reduced from 1,342 pages for 1912 to 903 pages for 1913, partly by changing the form of the tables presented and partly by omitting details which were not thought to be of sufficient importance for publication in this volume. All these details, however, remain available on file in the office.

The former Tables 5 and 8, summaries of imports and exports, were omitted, as they are included in the Statistical Abstract, and the statements of the trade with the noncontiguous territories of the United States were omitted, as they are published in a more extended form in the Monthly Summary. Table 3, "Imports of merchandise by articles and countries"; Table 6, "Exports of domestic merchandise by articles and countries"; and Table 15, "Imported merchandise entered for consumption," are issued as separate bulletins and are available a month or more in advance of the bound volume.

Several tables were omitted from this year's Statistical Abstract and others were condensed, reducing the number of pages from 836 for 1912 to 720 for 1913.

The statistical publications during the past year have not been issued as promptly as was desired, owing to the fact that the monthly returns from the collectors of customs were generally received later in the month than heretofore. This was caused partly by the reorganization of the Customs Service, effective July 1, 1913, which reduced the number of districts reporting to the Bureau from 152 to 49, thus concentrating the work of tabulating the daily transactions at the headquarters port of each district. The late revision of the tariff and consequent changes in the import classification also contributed to hamper the work at the customhouses.

A plan has now been developed whereby the advance portion of the copy for the Monthly Summary, showing comparative figures for the same month of last year and for accumulative periods of two previous years, is obtained by a photographic process. This results in a considerable saving of clerical labor, as heretofore the figures have been copied with pen and ink. This process will also be used in preparing copy for the quarterly statement of imports for consumption and for Tables 3 and 6 of Commerce and Navigation.

The mailing list for the quarterly statement of imports for consumption will contain, after eliminating those not entitled to free distribution, about 330 names. It is debatable whether this limited circulation justifies the continuance of this publication. It has been suggested that the quarterly be abolished and a statement for the

full calendar year substituted. In this connection it is suggested that the commercial public generally would prefer to have the annual volume of Commerce and Navigation published for the calendar instead of the fiscal year; the Bureau receives numerous requests for statements covering this period. Several Government offices, including the Geological Survey, Patent Office, Indian Office, and to some extent the Department of Agriculture, now issue their annual reports for the calendar year; the fiscal year of most of the foreign countries coincides with the calendar year. The advantage of making annual statistical reports for the calendar year is apparent.

The new tariff law became effective on October 4, 1913. In order to separate import transactions under the old and new tariffs the Bureau instructed collectors of customs to include all importations during the first three days of October under the old law with the returns for the month of September. This has proved a great convenience in preparing statements designed to show the effect of the new tariff.

The change of tariff made necessary the revision of the statistical import Schedules A and E. While the classification of the new tariff was somewhat simplified as compared with former laws, in many cases *ad valorem* rates being substituted for specific, the Bureau in preparing the new schedules has aimed to arrange the classification, as far as possible, along the same lines and in the same detail as in prior schedules, so that importations of specified articles under the present tariff may be compared with those under former laws.

At the instance of the Bureau there was included in the present tariff law a new provision, under Section III, paragraph F, authorizing the Secretary of the Treasury and the Secretary of Commerce to establish for statistical purposes a detailed list or enumeration of imported articles, and placing upon the consular officer to whom the invoices are presented for certification the duty to require that the necessary information be given in the invoices.

The statistical Schedule E prepared by this Bureau was designated as the official list authorized in the law, and collectors of customs were instructed to require that the detail called for therein be furnished in the entry of imported goods on and after July 1, 1914.

The Department of State also issued instructions to all consular officers to require that each class of goods be described in the invoice in the terminology of the schedule; and each consul was supplied with copies of the schedule for distribution among exporters and shippers. These requirements were not received favorably by foreign shippers and quite a number of protests have been received presenting arguments against them. Some objections seem to be well founded and the Bureau has agreed that the instructions to consuls be modified to the extent that a description in specific commercial terms giving the statistical data required may be accepted. It is confidently expected that when foreign shippers become familiar with the requirements the difficulties at first experienced will disappear and that more reliable statistics of imports will be obtained.

Paragraph R, Section IV, of the tariff law empowers the President to have ascertained each year the imports and exports of articles enumerated in the various paragraphs, and cause an estimate to be made of the domestic production and consumption of said articles.

The Bureau has cooperated with the Bureau of the Census toward the end that the schedules for the next census of manufactures may be prepared (as far as possible) to harmonize with the import and export schedules of the Bureau in order that a reliable estimate of consumption may be made for many specific articles.

At the request of the Treasury Department, a revision of that part of the Customs Regulations of 1908 which contains the instructions for the collectors of customs with reference to the statistical work of the Bureau has been undertaken.

For several years a statement has been published annually showing the shipments between the Atlantic and Pacific coasts of the United States via the Isthmuses of Panama and Tehuantepec. In view of the early completion of the Panama Canal and the general public interest in this traffic the statement has been published in the Monthly Summary since July, 1912, showing quantities and values of principal articles. With vessels passing through the canal on direct clearances from one coast to another it is doubtful whether the Bureau will be able to obtain this information, as shipper's manifests describing the cargo are not required by law in coastwise trade. At the Bureau's request, a draft of a bill, extending the provisions of sections 4197 to 4200 of the Revised Statutes to vessels clearing coastwise through the Panama Canal, was prepared by the Solicitor of the Department and submitted to both Houses of Congress.

There is another bill pending in Congress, the passage of which this Bureau regards as very desirable—H. R. 11097, designed to enable the collectors of customs to obtain more complete and reliable export statistics by requiring shippers of goods from interior points to seaboard ports for export to furnish a manifest fully describing such merchandise, and providing a penalty for failure to furnish such information. The statistics of exports to foreign countries by vessel are at present obtained by authority of the act of February 10, 1820 (sec. 4200, R. S.), which, while requiring that manifests describing the merchandise be filed with the collector of customs at the port of export before clearance of the vessel, provides no penalty on the shipper for failure to do so. Industrial conditions have changed so much since this law was enacted that it is entirely insufficient to accomplish the purpose in view and supplementary legislation is needed. The whole subject of imports and exports was thoroughly investigated during 1912 and 1913 by a joint committee appointed by the Secretaries of the Treasury and Commerce and Labor, the defects of the system were pointed out, and recommendations submitted to remedy them. The subject is of such importance that it should not be lost sight of.

Current demands for information on the part of Members of Congress, business organizations, and firms, involving the compilation of special statements, have increased to such an extent as to necessitate for the present the discontinuance of the preparation of material for another issue of the Statistical Abstract of Foreign Countries.

So far no funds have been appropriated by Congress for the purpose of resuming the compiling and publishing of the statistics of internal commerce, discontinued July 1, 1912. The demand for this information is attested by the numerous inquiries received by the Bureau from Members of Congress and others, relating to the vari-

ous phases of our domestic trade and to the traffic on internal waterways or coastwise. With the various projects of internal improvements which are being considered at the present time definite information on these subjects is needed more and more. The reports from which these statistics were formerly compiled are still being received and filed for reference in order that a continuous record may be available should the resumption of the work be authorized. The returns of bunker or fuel coal furnished to steamers engaged in the foreign trade have been regularly compiled and the totals published as a footnote in the domestic exports statement in the Monthly Summary. Beginning with July, 1914, similar figures of bunker or fuel oil will be collected and published.

In order to correlate the work of the division of statistics the sections of compilation and of examination and revision were brought into closer relations by placing them under the immediate direction of an assistant chief of division in charge of statistics, making the entire force interchangeable for all purposes of compiling and checking returns.

There was commenced during the latter part of the year a critical study of the office methods of compiling and revising the statistics and of the various blanks furnished to the collectors of customs for use in making their returns, and as a result many changes have been made.

The monthly return of "Imported commodities transported from exterior ports prior to appraisement" has been discontinued. The figures are known to be incomplete, being taken largely from informal entries, and the statement is not required by law. If a sufficient demand for this information develops, it may be compiled from the figures furnished by the receiving port which liquidates the entry.

The statement of "Unenumerated imports," which shows in detail the articles grouped in the Monthly Summary as "All other free" and "All other dutiable" articles, has been condensed and a uniform blank prepared for returns from the larger ports. The detail of articles by countries and customs districts compiled from this statement had gradually been extended to a proportion which required more time to compile than seemed justified for the comparatively small amounts involved, especially in view of the many demands for greater detail of the classes shown in the Monthly Summary which have to be denied on account of the limited clerical force in this office and at the customhouses.

The forms for returns of "Imports and exports of gold and silver" were simplified by omitting the recapitulation showing the mode of transportation, as this information has not been published for several years.

The monthly return of warehouse transactions heretofore in use, consisting of 25 pages of 15 lines each, gave a mass of detail which was not published. A new form consisting of a single sheet has been prepared which contains all the information required and is more conveniently examined and compiled.

In all of the more important cases where changes have been made the collectors of customs at the principal ports of entry were consulted, and the Bureau desires to acknowledge their hearty cooperation in all investigations looking toward the improvement of the statistical service.

In connection with these changes in method, a special effort has been made to emphasize to business men the promotive value of trade statistics. It is hoped that the habit of using statistical tables may be developed in the commercial public. It is believed that a much more extended use of statistical records can be encouraged by making them readily available in a convenient form for reference and by giving wide publicity to the various issues as they appear.

Criticism has at times been occasioned by the comparative meagerness of the statistical classifications of import and export products which it is at present practicable to present from this office in the monthly, quarterly, and annual statements. There are difficulties surrounding any departure from the classification of imports into the United States imposed by the terms of the tariff law. Further, it is extremely difficult to make any amplification of classifications of exports, in view of the limited clerical force assigned to statistical service in the various customs offices and in the Bureau in Washington. In order to amplify or materially change the present designations of these statistical classes, it is believed that commercial interest in the subject of trade statistics must be actively aroused. It must be strong enough to compel an orderly and carefully reasoned development of this branch of our service, under adequate provision for the necessary employees, both at Washington and in the field. Additional legislation is also required to obtain from the commercial public more accurate statements of exports. A bill (H. R. 11097), referred to on a preceding page, has already been introduced in Congress intended to give the authority required. It is hoped that with added clerical help a gradual and logical extension of practical commercial classifications of statistics may be made. Greater promptness in publication is also much to be desired, and plans intended to accomplish this result are being perfected.

DIVISION OF CONSULAR REPORTS.

This division had the most productive year in its history. An unusual number of reports were received from consular officers and from commercial agents, and this imposed an increased burden on this branch of the office. The editorial inspection of trade reports involves not only the necessary verification of manuscripts but includes the addition of useful data from reference sources available to the Bureau. The following table shows in detail the work of this division during the fiscal years 1912 to 1914:

| | 1912 | | 1913 | | 1914 | |
|--|------|--------|------|--------|------|--------|
| | No. | Pages. | No. | Pages. | No. | Pages. |
| Daily Consular and Trade Reports..... | 306 | 5,888 | 306 | 6,528 | 306 | 6,512 |
| Index to Consular and Trade Reports..... | 4 | 127 | 4 | 137 | 4 | 134 |
| Special Consular Series..... | 5 | 360 | 7 | 712 | 6 | 677 |
| Special Agents Series..... | 8 | 527 | 15 | 1,232 | 14 | 2,277 |
| Confidential Bulletins..... | 3 | 26 | 2 | 18 | 8 | 68 |
| Miscellaneous Series..... | 2 | 85 | 2 | 252 | 3 | 487 |
| Total..... | 328 | 7,013 | 336 | 8,579 | 341 | 10,128 |

The Bureau has further developed its policy of issuing commercial handbooks on foreign countries as opportunity has been given. Special Consular Series No. 61, on Russia, containing 254 pages and two large maps, was issued; to insure accuracy, the contents of this bulletin were submitted for criticism to the Russian commercial attaché in Washington. There were also issued similar bulletins on the Dominican Republic and on South America. The latter, entitled "South America as an Export Field," contains 216 pages and is replete with useful trade information in regard to that continent. Plans were instituted about a year ago for a handbook on the Empire of India, which has an import trade of over 500 million dollars annually, a trade in which the United States is credited with supplying only 3½ per cent. The Department of State cooperated with the Department of Commerce by permitting Consul Henry D. Baker to make commercial investigations in that country, and other consuls were authorized to contribute sections for the bulletin. This material, with other information compiled in Washington, will be issued as a comprehensive commercial reference book on India at as early a date as practicable. It is felt that such a guide should be of material assistance to American exporters in increasing our trade in a country where our present commerce is less than 6 cents per capita, as compared with sales in Australia of \$7 per capita.

The publication of this series of commercial handbooks should be continued as a current part of our promotive service. These handbooks should be made more comprehensive than the annual trade reports of consular officers, which describe current conditions for a single year only and which can more profitably be printed in the Daily Consular and Trade Reports. It should be noted that to date 600 copies of the Russian handbook, at 50 cents per copy, and 1,875 copies of the South American handbook, at 25 cents each, have been sold by the Superintendent of Documents. The American public has so long been accustomed to receive all Government documents free of cost that these large sales are especially gratifying.

The World Trade Directory, compiled by the division of consular reports in 1911, proved so popular that the entire edition of 3,500 was sold at \$5 a copy. During the year, in accordance with the plan of the Bureau to issue such trade directories in sections, by countries or convenient groups of countries, a revision of the South American portion of the World Trade Directory was prepared and issued in March, 1914. By the end of June of this year 1,900 copies, at \$1 per copy, had been sold, and the sale of a third edition is now continuing. Instructions have been sent to consular officers in the West Indies and Central America for a revision of the Trade Directory covering those districts, and it is hoped to issue this bulletin during the coming year. A very useful feature of these directories is the inclusion, where practicable, of lists of purchasing agencies in the United States and Europe of foreign import houses. This enables American manufacturers to treat promptly with actual buyers of merchandise at the nearest trade center.

SPECIAL CONSULAR REPORTS IN MANUSCRIPT.

American consuls have made very useful reports on various lines of trade. In many instances the publication of these reports has

been deemed inexpedient or impracticable for various reasons. These reports are made in series and some would require 1,000 pages or more if printed in full, while the publication of such material in condensed form would prevent the inspection and study by American manufacturers of many details of trade which are contained in the original reports. In order to give promotive effect to this material, many of these series have been placed on file in the branch offices of the Bureau and at trade centers where manufacturers may examine them, together with any samples which may have been transmitted by consular officers. The series of reports which have been made effective in promoting trade, without publication in printed form, are the following: Chocolate, cocoa, candy, and confectionery; vehicles other than motor; condensed and evaporated milk; watches and clocks; paper; refined sugars and sirups; excavating and mining machinery; and woolen and worsted goods. These reports cover those special phases of foreign markets and foreign trade conditions which have been indicated to the Bureau by practical business men as of primary interest to them. The instructions sent to consular officers covered these specific details, and the resulting reports undoubtedly conform very closely to the practical requirements of exporters.

TRADE OPPORTUNITIES—NOTICES FOR GOVERNMENT SUPPLIES.

During the year the division prepared 2,088 trade opportunities or specific requests for various classes of American goods. The record already established in the Bureau of successful results from these trade opportunities has been materially supplemented. Reports from consular officers who have forwarded these opportunities also indicate that firms in the United States follow up these matters more closely, and numerous instances are cited where direct sales have been made.

Five hundred and thirty notices for publication in the Daily Consular and Trade Reports, inviting tenders for various supplies for different branches of the Federal Government, were prepared during the year. These notices created increased interest by American manufacturers and resulted in the receipt of many bids from firms which heretofore have overlooked these opportunities for the sale of their products.

Confidential circulars to the number of 137 were edited and distributed.

DIVISION OF FOREIGN TARIFFS.

The compilation of statements in response to specific inquiries concerning the rates of duty and customs regulations in foreign countries has demanded a continually increasing share of the work of the division of foreign tariffs. The use of special multigraphed forms, with explanatory notes, definitions of dutiable weight and value, conversion equivalents, and lists of additional charges, has greatly reduced the labor involved in their preparation. Among the more comprehensive statements compiled were those showing the rates of duty on the following articles in the principal foreign countries: Wheat and flour; canned fruit and vegetables; playing cards; internal-

combustion engines; carbons for electrical use and batteries; and iron pipes in South America. The statement on playing cards was printed in the Daily Consular and Trade Reports and in Foreign Tariff Notes No. 12, and several of the others were multigraphed and distributed generally to manufacturers of the articles covered by the statement.

The adoption of the new tariff, October 3, 1913, resulted in numerous requests from other departments and from Congress for information concerning foreign tariffs. Comprehensive lists of the countries admitting free of duty wheat, wheat flour, semolina, potatoes, and potato products from the United States were compiled to facilitate compliance with the provision exempting from duty in the United States the corresponding imports from such countries; similar statements were compiled covering other articles; and numerous memoranda were prepared to assist the Department of State in its efforts to obtain the admission of American products into foreign countries at more favorable rates of duty.

In view of the practical value to exporters of the statements compiled in compliance with special requests, this service has been continued, notwithstanding the consequent delay in the preparation of tariff publications.

TARIFF PUBLICATIONS.

The foreign-tariff publications for the fiscal year 1914 are as follows: Supplements to the tariffs of Italy, Cuba, and Japan (Tariff Series Nos. 15C, 27B, and 28A); Commercial Travelers and Samples in South America (Tariff Series No. 19A); Foreign Import Duties on Office Appliances (Tariff Series No. 29); and Foreign Tariff Notes Nos. 10, 11, and 12, reprinting items relating to foreign tariffs, trademarks, and allied subjects from the Daily Consular and Trade Reports, from January, 1913, to March, 1914. One other report, entitled Foreign Import Duties on Motor Vehicles and Accessories (Tariff Series No. 30), was completed and will be published in the current fiscal year.

The free distribution of tariff publications, except Foreign Tariff Notes, to private individuals and business firms has been discontinued, and numbers of the tariff series are now sold by the Superintendent of Documents. Announcement of all new numbers is made to persons interested in the countries or articles covered by the report and to those specially requesting notification.

The distribution of the tariff publications of the International Customs Tariffs Bureau at Brussels, previously under control of the Treasury Department, has been transferred to the Bureau of Foreign and Domestic Commerce. These publications, containing complete tariffs of foreign countries and supplements to such tariffs, have so far been used by the Bureau only for reference purposes, and no attempt has been made to distribute them among American exporters. In order to make them available for distribution, it would be necessary in certain cases to make changes in terminology and supplement them with some explanatory notes. It has not been found practicable as yet to undertake the preparation of the supplementary statements suggested.

PATENTS AND TRADE-MARKS.

New laws and regulations concerning patents and trade-marks have been added to the collection of documents on file, but the failure to provide additional assistance has prevented the Bureau from undertaking to supply full information on these subjects to American exporters.

INVESTIGATING COST OF PRODUCTION.

Since August, 1912, the Bureau has been authorized by law to study the cost of producing articles subject to import duty at our ports of entry, a service closely parallel to that rendered by the former Tariff Board.

A study of the pottery industry in the United States was begun in 1913 and was continued actively during that year. Ninety per cent of the plants in this country were visited, and in February, 1914, four representatives of the Bureau proceeded to England to continue the work abroad. A volume of information in regard to this industry has been collected, and a preliminary report, giving a summary of results, has been issued. Later, a full report, giving as complete a picture as practicable of the conditions in the pottery manufacturing industries at home and abroad, will be published.

A similar study of branches of the clothing industry in the United States, including women's underwear and hosiery, knit goods, and men's ready-made clothing, has also been undertaken and is now in progress.

It is hoped that this work will justify itself as an essential part of the Federal activities. The reports present from a disinterested source not only those facts which are essential to an intelligent enactment of legislation in tariff matters but many facts of great constructive value to the industry concerned.

PUBLICATIONS.

As effective publicity for useful trade information is essentially the purpose of all its work, the record of the Bureau in this respect for the year is gratifying. In addition to the special bulletins of the office which are listed herewith, there were issued 128 confidential circulars, which have been distributed to the number of over 100,000 copies. The Daily Consular and Trade Reports contained 6,512 pages, and the full edition of 20,000 copies was distributed. The monthly, quarterly, and annual statistical publications have also been widely distributed.

LIST OF PUBLICATIONS ISSUED.

Special Agents Series:

- No. 72. Transportation Rates to the West Coast of South America.
- No. 73. Shoe and Leather Trade in Belgium, Spain, and Egypt.
- No. 74. Linen, Jute, and Hemp Industries in the United Kingdom.
- No. 75. Edible Oils in the Mediterranean District.
- No. 76. Commerce and Industries of Canada and Newfoundland.
- No. 77. Production and Use of Denatured Alcohol in Foreign Countries.
- No. 78. Commercial Organizations in Germany.
- No. 79. Commercial Organizations in Southern and Western Cities.
- No. 80. Cotton Goods in British East Africa, Uganda, Zanzibar, and German East Africa.

Special Agents Series—Continued.

- No. 81. South America as an Export Field.
- No. 82. Cotton Goods in Portuguese East Africa.
- No. 83. Cotton Goods in South Africa.
- No. 84. Cottonseed Products and Their Competitors in Northern Europe:
Part I. Cake and Meal.

Foreign Tariff Notes:

- Nos. 10, 11, and 12.

Foreign Tariff Series:

- No. 15c. Supplement to Tariff of Italy.
- No. 19a. Commercial Travelers and Samples in South America.
- No. 27b. Supplement to Tariff of Cuba.
- No. 28a. Supplement to Tariff of Japan.
- No. 29. Foreign Import Duties on Office Appliances.

Special Consular Reports:

- No. 60. Foreign Markets for Railway Supplies and Equipment.
- No. 61. Handbook on Commercial and Industrial Conditions in Russia.
- No. 62. Markets for American Fruit.
- No. 63. Cooking and Heating Stoves in Foreign Countries.
- No. 64. Utilization of Potatoes in Europe.
- No. 65. Development of the Dominican Republic.

Confidential Bulletins:

- No. 20. Markets for Lumber.
- No. 21. Pumps for Foreign Farms.
- No. 22. Market for American Flour in Constantinople.
- No. 23. Agricultural Machinery in Sicily and North Africa.
- No. 24. Bad Effect of Substitution of Goods.
- No. 25. Market for Coal in Constantinople.
- No. 26. Market for Iron and Steel Goods in India.
- No. 27. Suggestions for Increasing American Trade in France.

Miscellaneous Series:

- No. 6c. Promotion of Commerce.
- No. 6d. Promotion of Commerce.
- No. 10. Foreign Publications for Advertising American Goods, etc.
- No. 12. Publications on South America.
- No. 13. Trade Directory of South America.
- No. 14. Annual Review of the Foreign Commerce of the United States, 1913.
- No. 15. Trade of the United States with the World.

The very long series of confidential circulars which has been issued (Nos. 98 to 225, inclusive) covered opportunities for foreign trade extension of every variety. These circulars have been distributed as promptly as possible through the use of the Bureau's classified indexes of manufacturers.

The printing allotment for the past year was \$135,000, or about \$7,500 less than was expended in 1913. It has been necessary to watch the expenditure of this fund with care in order to print the periodical bulletins required by law, including the Daily Consular and Trade Reports, the Monthly Summary of Commerce and Finance, the Statistical Abstract, and Commerce and Navigation of the United States, and to publish also the numerous valuable special monographs by commercial agents and consular officers.

Many pages of material formerly printed have been omitted tentatively from our current publications, with, so far as can be found, little loss to the commercial public. Careful investigations are now being made through the field service of the office to ascertain the relative promotive value of various classes of information issued by the Bureau, and we will soon be in possession of very definite knowledge in this field. Further, in the belief that a small charge for the publications of the Bureau would be advisable, many special bulletins have been sold through the office of the Superintendent of Doc-

uments, and, since July 1, 1914, practically all its bulletins have been distributed by sale. Exception is made only in the free distribution of these publications to classes which serve the Bureau actively by providing additional useful publicity. These classes include newspapers and trade papers of all kinds, commercial organizations, schools and colleges, libraries, and similar sources of information open to the general public.

It has been found that the practice of placing a nominal price on our bulletins gives at once an excellent indication of their practical value to the business public. For example, the mailing list of *Monthly Sailing Dates of Steamships*, formerly distributed free to nearly 3,000 addresses, fell to about 200 in number when a nominal charge of 10 cents a copy was placed on this publication.

The monthly, quarterly, and annual statistical volumes impose the heaviest charges on the printing allotment, and it is believed that the Bureau is justified in testing the extent of the practical demand for this material by imposing nominal charges covering only the cost of paper and printing. There is a further advantage to the Bureau from this method of selling its publications, as the printing allotment is then available chiefly for new composition. Much additional material can be issued with the funds saved by discontinuing the free distribution of copies of costly documents. Under this plan practically unlimited editions are also made available, while the editions permitted to the Bureau by law have nearly always been inadequate to supply the legitimate public demand.

CONCLUSION.

In closing this record of a year that it is felt has been a very active and fruitful one for the Bureau, it may be stated that the future progress of the office now seems clearly assured. The Bureau's promotive work has already so far justified itself to Congress and the commercial public as to receive cordial support for the continued expansion and development of present activities and the adoption of new useful forms of service. A vast and far-reaching Federal system of trade promotion is now established, its agencies in the Departments of Commerce and State reporting on all phases of commerce from every important port and trade center in the world. The facilities for digesting and distributing these facts are more effective than ever before, and the Bureau is in closer relations with the business man, manufacturer, and exporter of the country, and obtains more effective publicity through these relations.

That the United States will continue to maintain and develop this service adequately, and aid in keeping the nation's position in the van among the great commercial countries in the march of commerce, can not be doubted.

Respectfully,

A. H. BALDWIN,
Chief of Bureau.

To Hon. WILLIAM C. REDFIELD,
Secretary of Commerce.

REPORT
OF THE
COMMISSIONER OF CORPORATIONS

221

REPORT

OF THE

COMMISSIONER OF CORPORATIONS.

DEPARTMENT OF COMMERCE,
BUREAU OF CORPORATIONS,
Washington, October 8, 1914.

SIR: The report of the Commissioner of Corporations for the fiscal year ended June 30, 1914, is hereby respectfully submitted.

According to an act of Congress of September 26, 1914, providing for a Federal Trade Commission, the Bureau of Corporations will be merged in the said commission immediately upon its organization. This act provides that the Bureau of Corporations shall then cease to exist, that its employees shall become employees of the commission, and that the commission shall take over the records, furniture, and equipment of the Bureau and the conduct of all work and proceedings in which it shall then be engaged, while all appropriations made for the support and maintenance of the Bureau and its work are continued and authorized to be expended by the commission.

THE FEDERAL TRADE COMMISSION AND THE BUREAU OF CORPORATIONS.

Very early in the administration of the Sherman Law the necessity for an administrative agency representing the whole people, to acquire information and give publicity as to facts concerning interstate commerce, became quite apparent. In the case of *Interstate Commerce Commission v. Brimson*, 154 U. S., 474 (1893), the late Justice Harlan used this language:

All must recognize the fact that the full information necessary as a basis of intelligent legislation by Congress from time to time upon the subject of interstate commerce can not be obtained, nor can the rules established for the regulation of such commerce be efficiently enforced otherwise than through the instrumentality of an administrative body representing the whole country, always watchful of the general interests, and charged with the duty, not only of obtaining the required information, but of compelling, by all lawful methods, obedience to such rules.

Early proposals for Federal supervision.—The earliest specific proposal for the establishment of a Federal administrative organ to supervise corporations was apparently that made by Hon. Francis G. Newlands in a letter to the secretary of the Conference on Trusts at Chicago, dated September 20, 1899. Mr. Newlands' suggestion was, in substance, that a Federal bureau similar to the office of the Comptroller of the Currency should be established, which should

receive reports from all corporations and act as an organ of publicity and supply information for the guidance of legislation. The first official recommendation for a Federal office to supervise corporations engaged in interstate trade was, apparently, a recommendation made by the Industrial Commission in its final report of February 10, 1902, as follows:

That there be created in the Treasury Department a permanent bureau, the duties of which shall be to register all State corporations engaged in interstate or foreign commerce; to secure from such corporations all reports needed to enable the Government to levy a franchise tax with certainty and justice, and to collect the same; to make such inspection and examination of the business and accounts of such corporations as will guarantee the completeness and accuracy of the information needed to ascertain whether such corporations are observing the conditions prescribed in the act, and to enforce penalties against delinquents; and to collate and publish information regarding such combinations and the industries in which they may be engaged, so as to furnish to the Congress proper information for possible future legislation.

Shortly after, Hon. P. C. Knox, Attorney General of the United States, in a communication addressed to the Chairman of the Committee on the Judiciary of the United States Senate, dated January 3, 1903, concerning the enforcement of the antitrust laws of the United States, made the following recommendations:

A commission should be created to aid in carrying out the provisions of the act of July 2, 1890, and any further legislation relating to commerce. It should be the duty of such commission, among other things, to make diligent investigation into the operations and conduct of all corporations, combinations, and concerns engaged in interstate or foreign commerce, and to gather such information and data as would enable it to make specific recommendations for additional legislation for the regulation of commerce, and annually, and oftener if it shall seem needful, to make report thereon to the President.

Such a commission should have authority to inquire into the management of the business of such corporations and concerns, to keep itself informed as to the manner and method in which the same is conducted, and to obtain from such concerns full and complete information necessary to enable the commission to perform the duties and carry out the objects for which it is created; it should have the power, when in its judgment it is necessary, to require reports from them and to require from them and their officers, agents, and employees specific answers to all questions upon which the commission needs information. As there are no means now provided by law for compelling testimony, such a law should provide that no person should be excused from attending and testifying or from producing books, papers, contracts, and documents before such commission or the courts.

The foregoing is of especial interest, because the recommendations were largely used as a basis for the provisions of the law regarding the powers of the Bureau of Corporations, established shortly thereafter.

Bureau of Corporations first established, 1903.—In the act of Congress of February 14, 1903, which established the Department of Commerce and Labor, provision was made for the organization of a Bureau of Corporations. The organization, functions, and powers of this Bureau are discussed in some detail below, but it may be noted here that its chief functions were those of investigation and publicity. The establishment of the Bureau of Corporations apparently satisfied for a time the demand for further supervision of the activities of corporations engaged in interstate commerce. This attitude may be explained in part by the generally prevailing opinion that further light was needed on this problem before definitive action in the direction of more elaborate Government control should be undertaken.

Trade commission bills in Congress.—The first bill introduced in Congress proposing the establishment of an independent commission to supervise corporations engaged in interstate commerce, other than common carriers, was apparently introduced by Hon. Francis G. Newlands in the United States Senate on July 5, 1911 (Senate bill No. 2941). In the same session of Congress, and in subsequent sessions, Senator Newlands introduced several other bills having the same general purpose. Subsequently, in both Senate and House, numerous bills for the establishment of some form of trade commission were introduced, particularly in the second session of the Sixty-third Congress (1913-14).

Kinds of trade commissions proposed in Congress.—The various trade commission bills introduced in Congress presented a great variety of projects, but, in general, they may be classified as either commissions to effect publicity or commissions to regulate commerce. The duties of the commission in the first case were chiefly confined to investigation and publicity, but sometimes included the duty to act as an office of formal registration and public record for corporations engaged in interstate commerce. With respect to the bills which intrusted the commission with regulative powers, two points of view were manifested. In most cases the underlying principle of regulation was that monopoly should not be allowed to exist in any form, and that injurious or unfair methods of competition which tend to promote monopoly should be regulated. In certain other bills, however, the continued existence of monopolistic organization was accepted, and provision was made for the regulation of corporations which possessed monopolistic powers. The latter system, however, found little favor in either House of Congress.

Message of President Wilson.—While the establishment of a trade commission had been urged, it remained for the recommendation of President Wilson contained in his message to the joint session of Congress on January 20, 1914, to finally give such impetus to the idea of the establishment of a commission in the aid of competition as to give promise of its enactment into law. In the message to Congress the President said:

And the business men of the country desire something more than that the menace of legal process in these matters be made explicit and intelligible. They desire the advice, the definite guidance and information which can be supplied by an administrative body, an interstate trade commission.

The opinion of the country would instantly approve of such a commission. It would not wish to see it empowered to make terms with monopoly or in any sort to assume control of business, as if the Government made itself responsible. It demands such a commission only as an indispensable instrument of information and publicity, as a clearing house for the facts by which both the public and the managers of great business undertakings should be guided, and as an instrumentality for doing justice to business where the processes of the courts or the natural forces of correction outside the courts are inadequate to adjust the remedy to the wrong in a way that will meet all the equities and circumstances of the case.

Producing industries, for example, which have passed the point up to which combination may be consistent with the public interest and the freedom of trade, can not always be dissected into their component units as readily as railroad companies or similar organizations can be. Their dissolution by ordinary legal process may oftentimes involve financial consequences likely to overwhelm the security market and bring upon it breakdown and confusion. There ought to be an administrative commission capable of directing and shaping such corrective processes, not only in aid of the courts but also by independent suggestion, if necessary.

Final form of Federal Trade Commission act.—It was by reason of this program that, in the early part of 1914, committee bills were introduced in each House of Congress by the committees having charge of matters relating to interstate commerce in the respective Houses. In the House of Representatives the Committee on Interstate and Foreign Commerce reported a bill (H. R. 15613) known as the Covington bill, which provided for a trade commission which should have extensive powers of investigation, and be an office of publicity and record; while in the Senate a bill was reported by the Committee on Interstate Commerce (S. 4160), known as the Newlands bill, which provided for a commission of a similar character. The Senate committee substituted its provisions for the House bill, amended in the committee in such a manner as to confer upon the commission the power to regulate methods of competition. These bills, having been amended and passed by the respective Houses in which they were introduced, were amended by the conference committee in a manner which combined the essential features of each, including the provisions of the Senate bill respecting the regulation of methods of competition. This conference bill passed both Houses of Congress by practically a unanimous vote, and was approved by the President on September 26, 1914.

FUNCTIONS OF THE BUREAU OF CORPORATIONS.

The functions of the Bureau of Corporations are defined in the second and fourth paragraphs of section 6 of the act of Congress establishing the Department of Commerce and Labor, approved February 14, 1903,* as follows:

The said Commissioner shall have power and authority to make, under the direction and control of the Secretary of Commerce and Labor, diligent investigation into the organization, conduct, and management of the business of any corporation, joint stock company or corporate combination engaged in commerce among the several States and with foreign nations excepting common carriers subject to "An Act to regulate commerce," approved February fourth, eighteen hundred and eighty-seven, and to gather such information and data as will enable the President of the United States to make recommendations to Congress for legislation for the regulation of such commerce, and to report such data to the President from time to time as he shall require; and the information so obtained or as much thereof as the President may direct shall be made public.

It shall also be the province and duty of said bureau, under the direction of the Secretary of Commerce and Labor, to gather, compile, publish, and supply useful information concerning corporations doing business within the limits of the United States as shall engage in interstate commerce or in commerce between the United States and any foreign country, including corporations engaged in insurance, and to attend to such other duties as may be hereafter provided by law.

The functions of the Bureau of Corporations were primarily those of investigation and publicity. The express purpose of its work was to enable the President to make recommendations for legislation for the regulation of interstate commerce.

In the third paragraph of the same section certain compulsory powers were conferred on the Commissioner of Corporations to enable him to execute these functions, such compulsory powers being applicable, however, only to those functions which are described in the second paragraph of the section (the first paragraph quoted above).

* The full text of this section of the law is given in Exhibit A.

While it was generally understood that the Bureau of Corporations would have the duty of investigating combinations and monopolies denounced by the Sherman antitrust act, the law itself refers only to investigation into the organization, conduct, and management of the business of any corporation, joint-stock company, or corporate combination engaged in commerce among the States or with foreign nations, except common carriers. The investigation of trusts, however, has frequently led the Bureau to look into the affairs of persons, associations, and corporations other than those specifically mentioned in the act, and its work of investigation has sometimes met with the objection that the Bureau was not legally competent to investigate their affairs. Uncertainty as to the Bureau's jurisdiction in this connection, particularly in respect to the matters in which it could avail itself of its compulsory powers, has in some degree hindered the activities of the Bureau.

General character of the work of the Bureau.—The principal work performed by the Bureau of Corporations has been the investigation of trusts and combinations in restraint of trade. It has, however, made investigations into other fields to which its activities were directed by the legislative or executive branches of the Government.

The advice of the Bureau has also been occasionally sought by the Department of Justice in connection with the enforcement of the antitrust laws. While the Bureau has never given advice officially with respect to plans of dissolution in antitrust suits, yet, in the Government's case against the Tobacco Combination, one of its experts was unofficially consulted by the Attorney General and his memoranda utilized by the circuit court which rendered the final decree. With respect to the International Harvester Co., however, the Department of Justice officially consulted the Bureau as to the character of a proposed dissolution under a consent decree, but in this instance the company in question refused to accede to the proposals of the Department of Justice and a suit was consequently instituted for a compulsory dissolution. The Bureau has also been consulted by the Department of Justice in connection with the preparation of bills in equity against corporate combinations, and in the procuring of evidence against them, notably in the cases against the Standard Oil Co. and the United States Steel Corporation. While some investigation has been made by the Bureau of the results accomplished by judicial decrees dissolving certain trusts, and while the Bureau has been also consulted by the Department of Justice in connection with these matters, no formal reports have been made thereon.

In accordance with the powers of the Bureau which have been cited above, various investigations have been made relating to other matters than trusts, and reports thereon have been published. The Bureau has also rendered assistance to other executive departments, as well as to the legislative branch of the Government, in furnishing information or expert assistance in work.

FUNCTIONS OF THE FEDERAL TRADE COMMISSION.

The functions of the Federal Trade Commission* include not only those functions of investigation and publicity which the Bureau of

* An act to create a Federal Trade Commission, to define its powers and duties, and for other purposes. The full text of this act is given in Exhibit B.

Corporations exercised, but also other functions of investigation, publicity, and recommendation, and in addition thereto the Commission has powers which are quasi-judicial in character. This class of functions distinguishes it in a very marked manner from the Bureau of Corporations.

INVESTIGATION, PUBLICITY, AND RECOMMENDATION.

The Commission is authorized to require corporations subject to its jurisdiction to make annual or special reports, or both, in such form as may be prescribed by the Commission, and to make written answers to specific questions regarding the organization and management of their business, or their relations to other corporations, partnerships, or individuals. Furthermore, the Commission is authorized to classify such corporations, and to make rules and regulations for the purpose of carrying out the provisions of the act. (Sec. 6, pars. *b* and *g*.)

The commission is given also a general power of investigation in respect to such corporations and their relations to other corporations, individuals, associations, and partnerships. (Sec. 6, par. *a*.)

Upon the direction of the President or either House of Congress, the Commission is authorized to investigate and report concerning any alleged violations of the antitrust acts by any corporation. (Sec. 6, par. *d*.)

The Commission is also authorized to investigate trade conditions in foreign countries with respect to combinations or other conditions affecting the foreign trade of the United States. (Sec. 6, par. *h*.)

Certain other functions of the Commission combine with investigation the duty of making particular recommendations.

If in any suit in equity brought by the Government under the antitrust acts the court is of opinion that the complainant is entitled to relief, it may refer the matter to the Commission as a master in chancery to give hearings to the parties and to make recommendations for an appropriate form of decree, but the court may adopt or reject such report in whole or in part and enter such decree as the case in its judgment may require. (Sec. 7.)

The Commission is empowered, upon the application of the Attorney General, to investigate the business of any corporation alleged to be violating the antitrust acts, and to make recommendations for readjustment which shall bring it in harmony with the law. (Sec. 6, par. *e*.)

Whenever a final decree has been entered against any corporation in a suit to restrain violations of the antitrust acts, the Commission is authorized to make an investigation of the manner in which the decree is carried out, and it is required to make such investigation, upon the application of the Attorney General. In the latter case it is required to transmit a report of its findings and recommendations to the Attorney General, and may publish such report in its own discretion. (Sec. 6, par. *c*.)

The Commission is authorized to make public such portions of the information obtained by it in accordance with law as it shall deem expedient in the public interest, except trade secrets and the names of customers, and further, to make annual and special reports to Congress with recommendations for legislation, and to provide for the

publication of its reports and decisions. (Sec. 6, par. f.) It is specially provided (sec. 10) that any officer or employee of the Commission who without its authority shall make public any information obtained shall be guilty of a misdemeanor and be punishable by fine and imprisonment. Thus, in the Trade Commission law, discretion as to publication is reposed in the Commission, and its recommendations for legislation are made to Congress, while the Bureau of Corporations has made its recommendations to the President, with whom rested discretion as to the publication of its reports.

The foregoing indicates that the Federal Trade Commission is given much broader discretion and authority than the Bureau of Corporations, and is given in addition thereto the very notable function of acting as a master in chancery in the preparation of trust decrees when requested to do so by the courts.

QUASI-JUDICIAL FUNCTIONS.

Both in the Trade Commission act and in the so-called Clayton act^{*} certain important provisions of declarative law are enunciated, and the authority to enforce compliance with these declarations is vested in the Federal Trade Commission.

Unfair methods of competition.—In section 5 of the Federal Trade Commission act itself the following very important provision of declarative law is stated:

That unfair methods of competition in commerce are hereby declared unlawful.

The act provides that the Commission is empowered and directed to prevent persons, partnerships, and corporations, except banks and certain common carriers, from using such unfair methods of competition, and establishes the procedure by which this may be done.

In addition to the substantive provisions contained in the Federal Trade Commission act with reference to unfair methods of competition, the Clayton act contains certain prohibitions, the enforcement of which is confided to the Federal Trade Commission as to corporations under its jurisdiction. The provisions of the law are very minute, and only the broad features are specified herein.

Price discrimination.—Section 2 prohibits, in certain cases, price discrimination where the effect may be to substantially lessen competition or tend to create a monopoly in any line of commerce.

Tying contracts.—Section 3 prohibits, in certain cases, so-called "tying contracts"—that is, contracts whereby, as a condition of sale or lease of commodities, the seller or lessor exacts from the purchaser or lessee an agreement that he shall not use or deal in other commodities except those furnished by the seller or lessor—where the effect may be to substantially lessen competition or tend to create a monopoly in any line of commerce.

Holding companies.—Section 7 prohibits, in certain cases, so-called "holding companies," or the ownership by one company of the stock of another, where the effect may be to substantially lessen competition between the companies concerned, or to restrain interstate commerce, or tend to create a monopoly.

^{*} An act to supplement existing laws against unlawful restraints and monopolies, and for other purposes. The full text of this act is given in Exhibit C.

Interlocking directorates.—Section 8 provides that two years after the enactment of the law so-called “interlocking directorates” shall be prohibited in certain cases, and in particular with respect to corporations having more than \$1,000,000 capital stock and surplus, other than certain banks and common carriers, wherever they are or shall have been theretofore, by virtue of their business and location of operations, competitors, so that the elimination of competition by agreement between them would constitute a violation of any of the provisions of any of the antitrust laws.

Enforcement of the prohibitions of the Clayton act.—The authority to enforce the foregoing provisions of the Clayton act is vested in the Federal Trade Commission as to all corporations which come within its jurisdiction, by section 11 of the said act.

PROCEDURE IN THE ENFORCEMENT OF THE LAW.

Briefly stated, the procedure in the enforcement of these substantive provisions of law declared in both the Federal Trade Commission act and the Clayton act, as recited above, is the following:

Whenever the Commission believes that any person, etc., has been using unfair methods of competition or violating the aforesaid provisions of the Clayton act, and that its intervention in the matter would be to the interest of the public,^a it shall serve a notice on the party complained of, who shall have the right to appear before it and show cause why an order should not be made to require that such practices cease. Other parties, for good cause shown, are allowed to intervene in the proceeding. On hearing had, if the Commission shall be of opinion that the practices are prohibited by the act, it shall serve an order on the person complained of to cease and desist. If such person fails to obey the order of the Commission, the latter may apply to the circuit court of appeals to enforce the same, and file a transcript of the record in the case. The court shall then take jurisdiction of the proceedings and have power to affirm, modify, or set aside the order of the Commission, but the findings of the Commission as to facts, if supported by evidence, shall be conclusive, and no additional evidence is permitted to be adduced without again referring the case to the Commission for a rehearing. The only review of the judgment and decree of the court is by writ of certiorari to the Supreme Court, as provided by law. Any party required to cease from using such method of competition or from violating the aforesaid provisions of the Clayton act, may obtain a court review in a similar manner.

The judicial review of the orders of the Commission thus provided for is what is sometimes termed a “narrow” review. That is to say, the Commission’s conclusions of fact are conclusive, if supported by evidence, but the court may modify or reverse the order on the basis of violation of constitutional provisions, absence of jurisdiction, or violation of the rules of procedure provided in the act.

These provisions of the Trade Commission act and the Clayton act establish, therefore, not only new rules of substantive law, but also repose in the Commission powers of a quasi-judicial character, which are entirely unknown to the Bureau of Corporations.

^a The proviso that intervention in the matter would be to the interest of the public is not expressly stated in the Clayton act.

COMPULSORY POWERS, PENALTIES, AND MISCELLANEOUS PROVISIONS.

In order to enable the Commission to perform the duties imposed upon it, the powers of visitation and subpoena are conferred in section 9, and in section 10 the refusal to obey the subpoena or lawful requirements of the Commission is made an offense punishable by fine and imprisonment.

The Commission and its authorized agents are empowered to examine and copy documentary evidence of any corporation investigated or proceeded against.

Any member of the Commission may sign subpoenas, and members of the Commission or the examiners of the Commission may administer oaths and receive evidence.

In case of refusal to obey a subpoena, the Commission may invoke the aid of the courts of the United States, which may order compliance therewith, and on failure punish the delinquents for contempt. Moreover, upon application of the Attorney General, at the request of the Commission, the courts have jurisdiction to issue writs of mandamus requiring any person or corporation to comply with the law or any order of the Commission in pursuance thereof.

The Commission is also authorized to take testimony by deposition.

No person is excused from testifying or producing evidence before the Commission on the ground that it might tend to incriminate him or to subject him to penalty or forfeiture, but it is provided that no natural person shall be criminally prosecuted on account of any transaction concerning which he may testify or produce evidence, if furnished in obedience to a subpoena, except in case of perjury.

Penalties of fine and imprisonment are provided for those who neglect or refuse to answer any lawful inquiry in obedience to a subpoena or lawful requirement of the Commission. Further, penalty of fine and imprisonment is provided for those who falsify records, fail to keep proper records, or refuse the Commission lawful access to the same, and penalty of fine for corporations which delay to file such reports as the Commission may lawfully require: such fines to be recoverable by the United States in a civil suit.

The penal provisions of the law are sweeping in their character, and find no counterpart in the organic act of the Bureau of Corporations.

Relations of the Commission to legislative, judicial, and other executive departments.—The Federal Trade Commission is organized in a manner similar to that of the Interstate Commerce Commission, and its relations to the legislative, judicial, and other executive departments of the Government are defined in the law.

Like the Interstate Commerce Commission, it is made independent of any of the other executive departments. In addition to the general executive direction reposed by the Constitution and the laws in the President, this law provides specifically that the Commission shall, at his direction, investigate alleged violations of the antitrust acts by any corporation. In this connection it may be noted that the President is authorized to direct the several departments and bureaus of the Government to furnish the Commission, upon request, all records and information in their possession relating to any corporation subject to this act. The Commission may also be called upon to perform certain of its functions at the request of the Attorney General,

namely, in investigating the execution of decrees against trusts and in making investigations and recommendations for bringing corporations, alleged to be violating the antitrust acts, in harmony with the law; while, furthermore, the Attorney General must first be applied to in case the Commission seeks to obtain writs of mandamus to compel compliance with its orders.

The law provides that either House of Congress may direct the Commission to investigate and report the facts relating to any alleged violation of the antitrust acts by any corporation. It is also provided that the Commission shall have power to make annual and special reports to Congress and recommendations for additional legislation, as well as reports regarding its investigations into conditions in foreign countries affecting the trade of the United States.

More important, however, are the relations of the Commission to the judicial department, which has jurisdiction to review and enforce its orders respecting unfair methods of competition or violations of sections 2, 3, 7, and 8 of the Clayton act, and to which the Commission must apply for the enforcement of its compulsory powers.

Compared with the Bureau of Corporations, therefore, the Commission has a more independent position, and a wider discretionary authority. It has frequently been urged, even with respect to the functions exercised by the Commissioner of Corporations, that it was preferable to confide them to an independent executive commission which would have the advantage of a greater continuity of policy and greater prestige and authority. The conferring of quasi-judicial powers on the Commission made this form of organization the only one which would be acceptable.

WORK OF THE BUREAU OF CORPORATIONS FOR THE YEAR.

The present report covers primarily the work of the Bureau of Corporations for the fiscal year ended June 30, 1914, but in view of the impending merger of the Bureau in the Federal Trade Commission, and of the fact that at the close of the next fiscal year the Bureau will no longer be in existence, a statement is made also concerning the work of the Bureau subsequent to the said fiscal year, which brings the account of its activities practically down to the time of its severance from this Department, thus avoiding the necessity of referring to it in detail in subsequent annual reports of the Secretary of Commerce.

The work of the Bureau of Corporations for the fiscal year was largely influenced by two circumstances. First, certain investigations commenced prior to the fiscal year, and in most cases during preceding administrations, were uncompleted and necessarily demanded first attention. Second, about the middle of the fiscal year definite steps were taken by the legislative branch of the Government to establish a Federal Trade Commission and to merge the Bureau of Corporations therein, as stated above, and to enact supplementary antitrust legislation; this situation made it seem expedient for the Bureau to devote a considerable part of its attention to the study of economic and legal problems connected with the proposed legislation; and to arrange its plans so as to be of greatest service to the proposed Trade Commission, if established.

Work pending at beginning of year.—Several investigations commenced by the Bureau in prior years remained uncompleted at the

beginning of the fiscal year covered by this report; namely, lumber, tobacco, farm machinery associations, State corporation taxation, fertilizer, and petroleum. Work on all except the last two was initiated before the present administration.

Substantial progress was made in all of these investigations, and, except for State taxation of corporations and the last two investigations just mentioned, they were nearly completed during the fiscal year under consideration. A more definite statement of the matters reported on by the Bureau during the fiscal year is given below.

New work undertaken.—Apart from a general investigation of certain legal and economic problems relating to proposed legislation, referred to above, which included a study of foreign legislation on trusts, etc., certain new investigations were initiated by the Bureau during the fiscal year.

Among the most important of these was an investigation into the economic character and effects of the system of resale price maintenance; i. e., the practice of manufacturers and distributors of fixing the price at which retailers or other dealers in their products shall sell to consumers or other purchasers.

A study was also commenced of the conflict of State laws relating to foreign corporations. The wide divergences in the prerequisites for doing business in the various States have often seriously hampered and restricted the business world. A comparative study of this subject and the preparation and suggestion of a model system of regulation, it is thought, would tend to facilitate the establishment of a more uniform system which would be of great benefit to the business world and the public at large.

An investigation of the lumber and shingle industry in the State of Washington with regard to the general economic conditions was initiated and completed.

A similar but more elaborate investigation was initiated into the general economic conditions in the beet-sugar industry.

In accordance with a resolution passed on March 28, 1914, by the United States Senate, an investigation was commenced with respect to alleged discrimination in the prices paid for crude petroleum in the Healdton or Ardmore field of Oklahoma. This investigation was necessarily connected, to a large extent, with the one initiated just before the beginning of the fiscal year into the petroleum industry with respect to the prices paid for Oklahoma crude oil.

The Bureau also had in contemplation a comprehensive study of the fundamental problems of the efficiency of trusts; that is to say, of the determination of the question whether, from the standpoint of business profits, and also from other standpoints of social welfare, the trust form of organization was really, as is often alleged, socially and economically efficient. While some tentative work was done by the Bureau in this connection during the fiscal year, the lack of an adequate appropriation made it impracticable to organize a comprehensive investigation of this very large subject. Nevertheless, a fairly comprehensive survey of the industrial field has been made, which will furnish a basis for this work if the appropriation is provided therefor.

Information for Federal Trade Commission—Card index of directors—Corporation reports.—In connection with the investigation of the efficiency of trusts the work was so designed as to be of value inde-

pendently thereof for the new Federal Trade Commission. Taking as a basis the value of output of the industries of the country, as furnished by the Census Bureau, about 90 per cent of these industries were examined in a general way, so as to have material at hand, if desired, for a brief general survey thereof; and a somewhat more comprehensive survey of about 20 leading industries has likewise been made, with a view of having similar information available, if needed by the Commission, upon the general facts of the processes of manufacture, organization, and dominant financial control, if any, in the respective industries. A card index of directors of the principal industrial, railroad, and public-utility corporations, insurance companies, and banks has also been completed for the same purpose. There are approximately 6,500 corporations, exclusive of steam railroads, banking and other financial corporations, and public-service corporations under the jurisdiction of the Interstate Commerce Commission that have a capital stock or bonded and other indebtedness amounting to \$1,000,000 or over engaged in interstate commerce. Approximately one-third of these have voluntarily furnished, upon request, reports as to their financial condition, organization, and other similar facts, all of which were procured with the design of being available for the use of the Federal Trade Commission upon its organization.

Work completed.—With respect to the investigations commenced during previous administrations, practically all data necessary for the final reports were collected and digested before the end of the fiscal year, although the final reports thereon have not in all cases been completed at the present date.

During the fiscal year a special report on taxation was issued, supplementing previous reports on State taxation of corporations and covering the taxation movement throughout the United States during 1912. Subsequent to the close of the fiscal year, namely, on September 8, 1914, another report on taxation was issued covering the systems of corporate taxation in the Mountain and Pacific Coast States.

A report was issued during the fiscal year in connection with the lumber investigation regarding conditions of production, wholesale distribution, and prices of lumber. The results of the investigation into the shingle and lumber industry in the State of Washington were also reported on. Subsequent to the fiscal year, further reports in connection with the lumber industry were issued relating to the concentration of the ownership of the timber resources of the country in particular localities and the concentration of land ownership among large timber owners.

The work of the Bureau during the fiscal year was by no means wholly confined to investigations which are the subject-matter of the Bureau's reports. Not only was considerable assistance given to other branches of the Government service, through details of members of the Bureau's staff, but also extensive work was done of a statistical, economic, and legal character, with a view to aiding Congress, particularly in connection with tariff and trust legislation.

Plans to complete pending work.—It is contemplated that prior to its absorption by the Federal Trade Commission, the Bureau of Corporations will complete and issue additional and final reports upon

tobacco, farm-machinery associations, taxation of corporations, Healdton oil, trust laws, and the conflict of corporation laws, and thus largely complete the work now pending in the Bureau so as to leave the force of the Bureau of Corporations available to as great a degree as possible for new work directed by the Federal Trade Commission.

PREVIOUS WORK OF THE BUREAU.

In view of the fact that the Bureau of Corporations will soon be merged in the Federal Trade Commission, it is appropriate to notice in this report the scope of the Bureau's work from its organization in February, 1903, to date—a period which covers more than 11½ years. Some indication has been given above (see p. 227) of the general character of the Bureau's work, which has been chiefly investigation and publicity, though in part advisory. It is neither convenient nor practicable to show in detail the character of the advisory work performed by the Bureau, but its published reports and statements cover in a comprehensive manner its activities in investigation and publicity. In Exhibit D of this report a statement is given of the various publications of the Bureau with some indication of the contents of the principal reports. This statement brings down to date a statement in similar form appended to the annual report of the Commissioner of Corporations for the fiscal year 1912.

EXPENDITURES OF THE BUREAU.

The accounts of the Bureau are kept in such a manner as to show the cost of each investigation, distinguishing expenditures made in connection with work in the office from those made in connection with work in the field. Certain expenditures of the Bureau, however, are not allocated to the several investigations, on account of their general character and because the allocation of such expenditures to particular investigations would be laborious and arbitrary and the results consequently of comparatively little value. Among these general expenditures which are not allocated to particular investigations are the salaries of the Commissioner, Deputy Commissioner, and Chief Clerk, the expenditures for the divisions of files and accounts and for messenger service, the costs of annual and sick leave, and of details to other bureaus. The expenditures for particular investigations are more satisfactorily shown, however, by giving only the direct expenditures definitely chargeable to them. These expenditures, as well as the general expenditures for the administration of the Bureau, are given in Exhibit E for each fiscal year from the organization of the Bureau in February, 1903, to the end of the fiscal year 1914. This statement brings down to date a similar statement made in the annual report of the Commissioner of Corporations for the fiscal year 1912.

In this connection it may be noted that certain expenditures made on account of the Bureau for such items as furniture, supplies, rent, and printing are not made from the funds of the Bureau but from those of the Department. These are not included in the statement described above.

The total expenditures of the Bureau for the fiscal year 1914 were \$219,486.22, and the total expenditures of the Bureau from its organization to the end of the fiscal year 1914 were \$1,921,452.84.

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RECOMMENDATIONS.

In consequence of the merger of the Bureau of Corporations in the Federal Trade Commission, and the fact that the direction of the present work of the Bureau will be intrusted to the said Commission, the usual statement with respect to policies and plans for the future has necessarily no place in this report.

Very respectfully,

JOSEPH E. DAVIES,
Commissioner of Corporations.

TO HON. WILLIAM C. REDFIELD,
Secretary of Commerce.

EXHIBITS.

Exhibit A.—ACT OF CONGRESS CREATING BUREAU OF CORPORATIONS.

SEC. 6. That there shall be in the Department of Commerce and Labor a bureau to be called the Bureau of Corporations, and a Commissioner of Corporations who shall be the head of said bureau, to be appointed by the President, who shall receive a salary of five thousand dollars per annum. There shall also be in said bureau a deputy commissioner who shall receive a salary of three thousand five hundred dollars per annum, and who shall in the absence of the Commissioner act as, and perform the duties of, the Commissioner of Corporations, and who shall also perform such other duties as may be assigned to him by the Secretary of Commerce and Labor or by the said Commissioner. There shall also be in the said bureau a chief clerk and such special agents, clerks, and other employees as may be authorized by law.

The said Commissioner shall have power and authority to make, under the direction and control of the Secretary of Commerce and Labor, diligent investigation into the organization, conduct, and management of the business of any corporation, joint stock company or corporate combination engaged in commerce among the several States and with foreign nations excepting common carriers subject to "An Act to regulate commerce," approved February fourth, eighteen hundred and eighty-seven, and to gather such information and data as will enable the President of the United States to make recommendations to Congress for legislation for the regulation of such commerce, and to report such data to the President from time to time as he shall require; and the information so obtained or as much thereof as the President may direct shall be made public.

In order to accomplish the purposes declared in the foregoing part of this section, the said Commissioner shall have and exercise the same power and authority in respect to corporations, joint stock companies and combinations subject to the provisions hereof, as is conferred on the Interstate Commerce Commission in said "Act to regulate commerce" and the amendments thereto in respect to common carriers so far as the same may be applicable, including the right to subpoena and compel the attendance and testimony of witnesses and the production of documentary evidence and to administer oaths. All the requirements, obligations, liabilities, and immunities imposed or conferred by said "Act to regulate commerce" and by "An Act in relation to testimony before the Interstate Commerce Commission," and so forth, approved February eleventh, eighteen hundred and ninety-three, supplemental to said "Act to regulate commerce," shall also apply to all persons who may be subpoenaed to testify as witnesses or to produce documentary evidence in pursuance of the authority conferred by this section.

It shall also be the province and duty of said bureau, under the direction of the Secretary of Commerce and Labor, to gather, compile, publish, and supply useful information concerning corporations doing business within the limits of the United States as shall engage in interstate commerce or in commerce between the United States and any foreign country, including corporations engaged in insurance, and to attend to such other duties as may be hereafter provided by law.

Approved, February 14, 1903. (32 Stat., 827.)

Exhibit B.—AN ACT TO CREATE A FEDERAL TRADE COMMISSION, TO DEFINE ITS POWERS AND DUTIES, AND FOR OTHER PURPOSES.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That a commission is hereby created and established, to be known as the Federal Trade Commission (hereinafter referred to as the commission), which shall be composed of five commissioners, who shall be appointed by the President, by and with the advice and consent of the Senate. Not more than three of the commissioners shall be members of the same political party. The first commissioners appointed shall continue in office for terms of three, four, five, six, and seven years, respectively, from the date of the taking effect of this Act, the term of each to be designated by the President, but their successors shall be appointed for terms of seven years, except that any person chosen to fill a vacancy shall be appointed only for the unexpired term of the commissioner whom he shall succeed. The commission shall choose a chairman from its own membership. No commissioner shall engage in any other business, vocation, or employment. Any commissioner may be removed by the President for inefficiency, neglect of duty, or malfeasance in office. A vacancy in the commission shall not impair the right of the remaining commissioners to exercise all the powers of the commission.

The commission shall have an official seal, which shall be judicially noticed.

SEC. 2. That each commissioner shall receive a salary of \$10,000 a year, payable in the same manner as the salaries of the judges of the courts of the United States. The commission shall appoint a secretary, who shall receive a salary of \$5,000 a year, payable in like manner, and it shall have authority to employ and fix the compensation of such attorneys, special experts, examiners, clerks, and other employees as it may from time to time find necessary for the proper performance of its duties and as may be from time to time appropriated for by Congress.

With the exception of the secretary, a clerk to each commissioner, the attorneys, and such special experts and examiners as the commission may from time to time find necessary for the conduct of its work, all employees of the commission shall be a part of the classified civil service, and shall enter the service under such rules and regulations as may be prescribed by the commission and by the Civil Service Commission.

All of the expenses of the commission, including all necessary expenses for transportation incurred by the commissioners or by their employees under their orders, in making any investigation, or upon official business in any other places than in the city of Wash-

ington, shall be allowed and paid on the presentation of itemized vouchers therefor approved by the commission.

Until otherwise provided by law, the commission may rent suitable offices for its use.

The Auditor for the State and Other Departments shall receive and examine all accounts of expenditures of the commission.

Sec. 3. That upon the organization of the commission and election of its chairman, the Bureau of Corporations and the offices of Commissioner and Deputy Commissioner of Corporations shall cease to exist; and all pending investigations and proceedings of the Bureau of Corporations shall be continued by the commission.

All clerks and employees of the said bureau shall be transferred to and become clerks and employees of the commission at their present grades and salaries. All records, papers, and property of the said bureau shall become records, papers, and property of the commission, and all unexpended funds and appropriations for the use and maintenance of the said bureau, including any allotment already made to it by the Secretary of Commerce from the contingent appropriation for the Department of Commerce for the fiscal year nineteen hundred and fifteen, or from the departmental printing fund for the fiscal year nineteen hundred and fifteen, shall become funds and appropriations available to be expended by the commission in the exercise of the powers, authority, and duties conferred on it by this Act.

The principal office of the commission shall be in the city of Washington, but it may meet and exercise all its powers at any other place. The commission may, by one or more of its members, or by such examiners as it may designate, prosecute any inquiry necessary to its duties in any part of the United States.

Sec. 4. That the words defined in this section shall have the following meaning when found in this Act, to wit:

"Commerce" means commerce among the several States or with foreign nations, or in any Territory of the United States or in the District of Columbia, or between any such Territory and another, or between any such Territory and any State or foreign nation, or between the District of Columbia and any State or Territory or foreign nation.

"Corporation" means any company or association incorporated or unincorporated, which is organized to carry on business for profit and has shares of capital or capital stock, and any company or association, incorporated or unincorporated, without shares of capital or capital stock, except partnerships, which is organized to carry on business for its own profit or that of its members.

"Documentary evidence" means all documents, papers, and correspondence in existence at and after the passage of this Act.

"Acts to regulate commerce" means the Act entitled "An Act to regulate commerce," approved February fourteenth, eighteen hundred and eighty-seven, and all Acts amendatory therof and supplementary thereto.

"Antitrust acts" means the Act entitled "An Act to protect trade and commerce against unlawful restraints and monopolies," approved July second, eighteen hundred and ninety; also the sections seventy-three to seventy-seven, inclusive, of an Act entitled "An Act to reduce taxation, to provide revenue for the Government, and for

other purposes," approved August twenty-seventh, eighteen hundred and ninety-four; and also the Act entitled "An Act to amend sections seventy-three and seventy-six of the Act of August twenty-seventh, eighteen hundred and ninety-four, entitled 'An Act to reduce taxation, to provide revenue for the Government, and for other purposes,'" approved February twelfth, nineteen hundred and thirteen.

SEC. 5. That unfair methods of competition in commerce are hereby declared unlawful.

The commission is hereby empowered and directed to prevent persons, partnerships, or corporations, except banks, and common carriers subject to the Acts to regulate commerce, from using unfair methods of competition in commerce.

Whenever the commission shall have reason to believe that any such person, partnership, or corporation has been or is using any unfair method of competition in commerce, and if it shall appear to the commission that a proceeding by it in respect thereof would be to the interest of the public, it shall issue and serve upon such person, partnership, or corporation a complaint stating its charges in that respect, and containing a notice of a hearing upon a day and at a place therein fixed at least thirty days after the service of said complaint. The person, partnership, or corporation so complained of shall have the right to appear at the place and time so fixed and show cause why an order should not be entered by the commission requiring such person, partnership, or corporation to cease and desist from the violation of the law so charged in said complaint. Any person, partnership, or corporation may make application, and upon good cause shown may be allowed by the commission, to intervene and appear in said proceeding by counsel or in person. The testimony in any such proceeding shall be reduced to writing and filed in the office of the commission. If upon such hearing the commission shall be of the opinion that the method of competition in question is prohibited by this Act, it shall make a report in writing in which it shall state its findings as to the facts, and shall issue and cause to be served on such person, partnership, or corporation an order requiring such person, partnership, or corporation to cease and desist from using such method of competition. Until a transcript of the record in such hearing shall have been filed in a circuit court of appeals of the United States, as hereinafter provided, the commission may at any time, upon such notice and in such manner as it shall deem proper, modify or set aside, in whole or in part, any report or any order made or issued by it under this section.

If such person, partnership, or corporation fails or neglects to obey such order of the commission while the same is in effect, the commission may apply to the circuit court of appeals of the United States, within any circuit where the method of competition in question was used or where such person, partnership, or corporation resides or carries on business, for the enforcement of its order, and shall certify and file with its application a transcript of the entire record in the proceeding, including all the testimony taken and the report and order of the commission. Upon such filing of the application and transcript the court shall cause notice thereof to be served upon such person, partnership, or corporation and thereupon shall have jurisdiction of the proceeding and of the question determined therein, and shall have power to make and enter upon the pleadings, testimony, and pro-

ceedings set forth in such transcript a decree affirming, modifying, or setting aside the order of the commission. The findings of the commission as to the facts, if supported by testimony, shall be conclusive. If either party shall apply to the court for leave to adduce additional evidence, and shall show to the satisfaction of the court that such additional evidence is material and that there were reasonable grounds for the failure to adduce such evidence in the proceeding before the commission, the court may order such additional evidence to be taken before the commission and to be adduced upon the hearing in such manner and upon such terms and conditions as to the court may seem proper. The commission may modify its findings as to the facts, or make new findings, by reason of the additional evidence so taken, and it shall file such modified or new findings, which, if supported by testimony, shall be conclusive, and its recommendation, if any, for the modification or setting aside of its original order, with the return of such additional evidence. The judgment and decree of the court shall be final, except that the same shall be subject to review by the Supreme Court upon certiorari as provided in section two hundred and forty of the Judicial Code.

Any party required by such order of the commission to cease and desist from using such method of competition may obtain a review of such order in said circuit court of appeals by filing in the court a written petition praying that the order of the commission be set aside. A copy of such petition shall be forthwith served upon the commission, and thereupon the commission forthwith shall certify and file in the court a transcript of the record as hereinbefore provided. Upon the filing of the transcript the court shall have the same jurisdiction to affirm, set aside, or modify the order of the commission as in the case of an application by the commission for the enforcement of its order, and the findings of the commission as to the facts, if supported by testimony, shall in like manner be conclusive.

The jurisdiction of the circuit court of appeals of the United States to enforce, set aside, or modify orders of the commission shall be exclusive.

Such proceedings in the circuit court of appeals shall be given precedence over other cases pending therein, and shall be in every way expedited. No order of the commission or judgment of the court to enforce the same shall in any wise relieve or absolve any person, partnership, or corporation from any liability under the anti-trust acts.

Complaints, orders, and other processes of the commission under this section may be served by anyone duly authorized by the commission, either (a) by delivering a copy thereof to the person to be served, or to a member of the partnership to be served, or to the president, secretary, or other executive officer or a director of the corporation to be served; or (b) by leaving a copy thereof at the principal office or place of business of such person, partnership, or corporation; or (c) by registering and mailing a copy thereof addressed to such person, partnership, or corporation at his or its principal office or place of business. The verified return by the person so serving said complaint, order, or other process setting forth the manner of said service shall be proof of the same, and the return post-office receipt for said complaint, order, or other process registered and mailed as aforesaid shall be proof of the service of the same.

SEC. 6. That the commission shall also have power—

(a) To gather and compile information concerning, and to investigate from time to time the organization, business, conduct, practices, and management of any corporation engaged in commerce, excepting banks and common carriers subject to the Act to regulate commerce, and its relation to other corporations and to individuals, associations, and partnerships.

(b) To require, by general or special orders, corporations engaged in commerce, excepting banks, and common carriers subject to the Act to regulate commerce, or any class of them, or any of them, respectively, to file with the commission in such form as the commission may prescribe annual or special, or both annual and special, reports or answers in writing to specific questions, furnishing to the commission such information as it may require as to the organization, business, conduct, practices, management, and relation to other corporations, partnerships, and individuals of the respective corporations filing such reports or answers in writing. Such reports and answers shall be made under oath, or otherwise, as the commission may prescribe, and shall be filed with the commission within such reasonable period as the commission may prescribe, unless additional time be granted in any case by the commission.

(c) Whenever a final decree has been entered against any defendant corporation in any suit brought by the United States to prevent and restrain any violation of the antitrust Acts, to make investigation, upon its own initiative, of the manner in which the decree has been or is being carried out, and upon the application of the Attorney General it shall be its duty to make such investigation. It shall transmit to the Attorney General a report embodying its findings and recommendations as a result of any such investigation, and the report shall be made public in the discretion of the commission.

(d) Upon the direction of the President or either House of Congress to investigate and report the facts relating to any alleged violations of the antitrust Acts by any corporation.

(e) Upon the application of the Attorney General to investigate and make recommendations for the readjustment of the business of any corporation alleged to be violating the antitrust Acts in order that the corporation may thereafter maintain its organization, management, and conduct of business in accordance with law.

(f) To make public from time to time such portions of the information obtained by it hereunder, except trade secrets and names of customers, as it shall deem expedient in the public interest; and to make annual and special reports to the Congress and to submit therewith recommendations for additional legislation; and to provide for the publication of its reports and decisions in such form and manner as may be best adapted for public information and use.

(g) From time to time to classify corporations and to make rules and regulations for the purpose of carrying out the provisions of this Act.

(h) To investigate, from time to time, trade conditions in and with foreign countries where associations, combinations, or practices of manufacturers, merchants, or traders, or other conditions, may affect the foreign trade of the United States, and to report to Congress thereon, with such recommendations as it deems advisable.

SEC. 7. That in any suit in equity brought by or under the direction of the Attorney General as provided in the antitrust Acts, the court may, upon the conclusion of the testimony therein, if it shall be then of opinion that the complainant is entitled to relief, refer said suit to the commission, as a master in chancery, to ascertain and report an appropriate form of decree therein. The commission shall proceed upon such notice to the parties and under such rules of procedure as the court may prescribe, and upon the coming in of such report such exceptions may be filed and such proceedings had in relation thereto as upon the report of a master in other equity causes, but the court may adopt or reject such report, in whole or in part, and enter such decree as the nature of the case may in its judgment require.

SEC. 8. That the several departments and bureaus of the Government when directed by the President shall furnish the commission, upon its request, all records, papers, and information in their possession relating to any corporation subject to any of the provisions of this Act, and shall detail from time to time such officials and employees to the commission as he may direct.

SEC. 9. That for the purposes of this Act the commission, or its duly authorized agent or agents, shall at all reasonable times have access to, for the purpose of examination, and the right to copy any documentary evidence of any corporation being investigated or proceeded against; and the commission shall have power to require by subpoena the attendance and testimony of witnesses and the production of all such documentary evidence relating to any matter under investigation. Any member of the commission may sign subpoenas, and members and examiners of the commission may administer oaths and affirmations, examine witnesses, and receive evidence.

Such attendance of witnesses, and the production of such documentary evidence, may be required from any place in the United States, at any designated place of hearing. And in case of disobedience to a subpoena the commission may invoke the aid of any court of the United States in requiring the attendance and testimony of witnesses and the production of documentary evidence.

Any of the district courts of the United States within the jurisdiction of which such inquiry is carried on may, in case of contumacy or refusal to obey a subpoena issued to any corporation or other person, issue an order requiring such corporation or other person to appear before the commission, or to produce documentary evidence if so ordered, or to give evidence touching the matter in question; and any failure to obey such order of the court may be punished by such court as a contempt thereof.

Upon the application of the Attorney General of the United States, at the request of the commission, the district courts of the United States shall have jurisdiction to issue writs of mandamus commanding any person or corporation to comply with the provisions of this Act or any order of the commission made in pursuance thereof.

The commission may order testimony to be taken by deposition in any proceeding or investigation pending under this Act at any stage of such proceeding or investigation. Such depositions may be taken before any person designated by the commission and having power to administer oaths. Such testimony shall be reduced to writing by the person taking the deposition, or under his direction, and shall then be subscribed by the deponent. Any person may be

compelled to appear and depose and to produce documentary evidence in the same manner as witnesses may be compelled to appear and testify and produce documentary evidence before the commission as hereinbefore provided.

Witnesses summoned before the commission shall be paid the same fees and mileage that are paid witnesses in the courts of the United States, and witnesses whose depositions are taken and the persons taking the same shall severally be entitled to the same fees as are paid for like services in the courts of the United States.

No person shall be excused from attending and testifying or from producing documentary evidence before the commission or in obedience to the subpoena of the commission on the ground or for the reason that the testimony or evidence, documentary or otherwise, required of him may tend to criminate him or subject him to a penalty or forfeiture. But no natural person shall be prosecuted or subjected to any penalty or forfeiture for or on account of any transaction, matter, or thing concerning which he may testify, or produce evidence, documentary or otherwise, before the commission in obedience to a subpoena issued by it: *Provided*, That no natural person so testifying shall be exempt from prosecution and punishment for perjury committed in so testifying.

SEC. 10. That any person who shall neglect or refuse to attend and testify, or to answer any lawful inquiry, or to produce documentary evidence, if in his power to do so, in obedience to the subpoena or lawful requirement of the commission, shall be guilty of an offense and upon conviction thereof by a court of competent jurisdiction shall be punished by a fine of not less than \$1,000 nor more than \$5,000, or by imprisonment for not more than one year, or by both such fine and imprisonment.

Any person who shall willfully make, or cause to be made, any false entry or statement of fact in any report required to be made under this Act, or who shall willfully make, or cause to be made, any false entry in any account, record, or memorandum kept by any corporation subject to this Act, or who shall willfully neglect or fail to make, or to cause to be made, full, true, and correct entries in such accounts, records, or memoranda of all facts and transactions appertaining to the business of such corporation, or who shall willfully remove out of the jurisdiction of the United States, or willfully mutilate, alter, or by any other means falsify any documentary evidence of such corporation, or who shall willfully refuse to submit to the commission or to any of its authorized agents, for the purpose of inspection and taking copies, any documentary evidence of such corporation in his possession or within his control, shall be deemed guilty of an offense against the United States, and shall be subject, upon conviction in any court of the United States of competent jurisdiction, to a fine of not less than \$1,000 nor more than \$5,000, or to imprisonment for a term of not more than three years, or to both such fine and imprisonment.

If any corporation required by this Act to file any annual or special report shall fail so to do within the time fixed by the commission for filing the same, and such failure shall continue for thirty days after notice of such default, the corporation shall forfeit to the United States the sum of \$100 for each and every day of the continuance of such failure, which forfeiture shall be payable into the Treasury of the United States, and shall be recoverable in a civil suit in the name of

the United States brought in the district where the corporation has its principal office or in any district in which it shall do business. It shall be the duty of the various district attorneys, under the direction of the Attorney General of the United States, to prosecute for the recovery of forfeitures. The costs and expenses of such prosecution shall be paid out of the appropriation for the expenses of the courts of the United States.

Any officer or employee of the commission who shall make public any information obtained by the commission without its authority, unless directed by a court, shall be deemed guilty of a misdemeanor, and, upon conviction thereof, shall be punished by a fine not exceeding \$5,000, or by imprisonment not exceeding one year, or by fine and imprisonment, in the discretion of the court.

SEC. 11. Nothing contained in this Act shall be construed to prevent or interfere with the enforcement of the provisions of the antitrust Acts or the Acts to regulate commerce, nor shall anything contained in the Act be construed to alter, modify, or repeal the said antitrust Acts or the Acts to regulate commerce or any part or parts thereof.

Approved, September 26, 1914.

Exhibit C.—AN ACT TO SUPPLEMENT EXISTING LAWS AGAINST UNLAWFUL RESTRAINTS AND MONOPOLIES, AND FOR OTHER PURPOSES.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That "antitrust laws," as used herein, includes the Act entitled "An Act to protect trade and commerce against unlawful restraints and monopolies," approved July second, eighteen hundred and ninety; sections seventy-three to seventy-seven, inclusive, of an Act entitled "An Act to reduce taxation, to provide revenue for the Government, and for other purposes," of August twenty-seventh, eighteen hundred and ninety-four; an Act entitled "An Act to amend sections seventy-three and seventy-six of the Act of August twenty-seventh, eighteen hundred and ninety-four, entitled 'An Act to reduce taxation, to provide revenue for the Government, and for other purposes,'" approved February twelfth, nineteen hundred and thirteen; and also this Act.

"Commerce," as used herein, means trade or commerce among the several States and with foreign nations, or between the District of Columbia or any Territory of the United States and any State, Territory, or foreign nation, or between any insular possessions or other places under the jurisdiction of the United States, or between any such possession or place and any State or Territory of the United States or the District of Columbia or any foreign nation, or within the District of Columbia or any Territory or any insular possession or other place under the jurisdiction of the United States: *Provided*, That nothing in this Act contained shall apply to the Philippine Islands.

The word "person" or "persons" wherever used in this Act shall be deemed to include corporations and associations existing under or authorized by the laws of either the United States, the laws of any of the Territories, the laws of any State, or the laws of any foreign country.

SEC. 2. That it shall be unlawful for any person engaged in commerce, in the course of such commerce, either directly or indirectly to discriminate in price between different purchasers of commodities, which commodities are sold for use, consumption, or resale within the United States or any Territory thereof or the District of Columbia or any insular possession or other place under the jurisdiction of the United States, where the effect of such discrimination may be to substantially lessen competition or tend to create a monopoly in any line of commerce: *Provided*, That nothing herein contained shall prevent discrimination in price between purchasers of commodities on account of differences in the grade, quality, or quantity of the commodity sold, or that makes only due allowance for difference in the cost of selling or transportation, or discrimination in price in the same or different communities made in good faith to meet competition: *And provided further*, That nothing herein contained shall prevent persons engaged in selling goods, wares, or merchandise in commerce from selecting their own customers in bona fide transactions and not in restraint of trade.

SEC. 3. That it shall be unlawful for any person engaged in commerce, in the course of such commerce, to lease or make a sale or contract for sale of goods, wares, merchandise, machinery, supplies or other commodities, whether patented or unpatented, for use, consumption or resale within the United States or any Territory thereof or the District of Columbia or any insular possession or other place under the jurisdiction of the United States, or fix a price charged therefor, or discount from, or rebate upon, such price, on the condition, agreement or understanding that the lessee or purchaser thereof shall not use or deal in the goods, wares, merchandise, machinery, supplies or other commodities of a competitor or competitors of the lessor or seller, where the effect of such lease, sale, or contract for sale or such condition, agreement or understanding may be to substantially lessen competition or tend to create a monopoly in any line of commerce.

SEC. 4. That any person who shall be injured in his business or property by reason of anything forbidden in the antitrust laws may sue therefor in any district court of the United States in the district in which the defendant resides or is found or has an agent, without respect to the amount in controversy, and shall recover threefold the damages by him sustained, and the cost of suit, including a reasonable attorney's fee.

SEC. 5. That a final judgment or decree hereafter rendered in any criminal prosecution or in any suit or proceeding in equity brought by or on behalf of the United States under the antitrust laws to the effect that a defendant has violated said laws shall be prima facie evidence against such defendant in any suit or proceeding brought by any other party against such defendant under said laws as to all matters respecting which said judgment or decree would be an estoppel as between the parties thereto: *Provided*, This section shall not apply to consent judgments or decrees entered before any testimony has been taken: *Provided further*, This section shall not apply to consent judgments or decrees rendered in criminal proceedings or suits in equity, now pending, in which the taking of testimony has been commenced but has not been concluded, provided such judgments or decrees are rendered before any further testimony is taken.

Whenever any suit or proceeding in equity or criminal prosecution is instituted by the United States to prevent, restrain or punish violations of any of the antitrust laws, the running of the statute of limitations in respect of each and every private right of action arising under said laws and based in whole or in part on any matter complained of in said suit or proceeding shall be suspended during the pendency thereof.

SEC. 6. That the labor of a human being is not a commodity or article of commerce. Nothing contained in the antitrust laws shall be construed to forbid the existence and operation of labor, agricultural, or horticultural organizations, instituted for the purposes of mutual help, and not having capital stock or conducted for profit, or to forbid or restrain individual members of such organizations from lawfully carrying out the legitimate objects thereof; nor shall such organizations, or the members thereof, be held or construed to be illegal combinations or conspiracies in restraint of trade, under the antitrust laws.

SEC. 7. That no corporation engaged in commerce shall acquire, directly or indirectly, the whole or any part of the stock or other share capital of another corporation engaged also in commerce, where the effect of such acquisition may be to substantially lessen competition between the corporation whose stock is so acquired and the corporation making the acquisition, or to restrain such commerce in any section or community, or tend to create a monopoly of any line of commerce.

No corporation shall acquire, directly or indirectly, the whole or any part of the stock or other share capital of two or more corporations engaged in commerce where the effect of such acquisition, or the use of such stock by the voting or granting of proxies or otherwise, may be to substantially lessen competition between such corporations, or any of them, whose stock or other share capital is so acquired, or to restrain such commerce in any section or community, or tend to create a monopoly of any line of commerce.

This section shall not apply to corporations purchasing such stock solely for investment and not using the same by voting or otherwise to bring about, or in attempting to bring about, the substantial lessening of competition. Nor shall anything contained in this section prevent a corporation engaged in commerce from causing the formation of subsidiary corporations for the actual carrying on of their immediate lawful business, or the natural and legitimate branches or extensions thereof, or from owning and holding all or a part of the stock of such subsidiary corporations, when the effect of such formation is not to substantially lessen competition.

Nor shall anything herein contained be construed to prohibit any common carrier subject to the laws to regulate commerce from aiding in the construction of branches or short lines so located as to become feeders to the main line of the company so aiding in such construction or from acquiring or owning all or any part of the stock of such branch lines, nor to prevent any such common carrier from acquiring and owning all or any part of the stock of a branch or short line constructed by an independent company where there is no substantial competition between the company owning the branch line so con-

structed and the company owning the main line acquiring the property or an interest therein, nor to prevent such common carrier from extending any of its lines through the medium of the acquisition of stock or otherwise of any other such common carrier where there is no substantial competition between the company extending its lines and the company whose stock, property, or an interest therein is so acquired.

Nothing contained in this section shall be held to affect or impair any right heretofore legally acquired: *Provided*, That nothing in this section shall be held or construed to authorize or make lawful anything heretofore prohibited or made illegal by the antitrust laws, nor to exempt any person from the penal provisions thereof or the civil remedies therein provided.

Sec. 8. That from and after two years from the date of the approval of this Act no person shall at the same time be a director or other officer or employee of more than one bank, banking association or trust company, organized or operating under the laws of the United States, either of which has deposits, capital, surplus, and undivided profits aggregating more than \$5,000,000; and no private banker or person who is a director in any bank or trust company, organized and operating under the laws of a State, having deposits, capital, surplus, and undivided profits aggregating more than \$5,000,000, shall be eligible to be a director in any bank or banking association organized or operating under the laws of the United States. The eligibility of a director, officer, or employee under the foregoing provisions shall be determined by the average amount of deposits, capital, surplus, and undivided profits as shown in the official statements of such bank, banking association, or trust company filed as provided by law during the fiscal year next preceding the date set for the annual election of directors, and when a director, officer, or employee has been elected or selected in accordance with the provisions of this Act it shall be lawful for him to continue as such for one year thereafter under said election or employment.

No bank, banking association or trust company, organized or operating under the laws of the United States, in any city or incorporated town or village of more than two hundred thousand inhabitants, as shown by the last preceding decennial census of the United States, shall have as a director or other officer or employee any private banker or any director or other officer or employee of any other bank, banking association or trust company located in the same place: *Provided*, That nothing in this section shall apply to mutual savings banks not having a capital stock represented by shares: *Provided further*, That a director or other officer or employee of such bank, banking association, or trust company may be a director or other officer or employee of not more than one other bank or trust company organized under the laws of the United States or any State where the entire capital stock of one is owned by stockholders in the other: *And provided further*, That nothing contained in this section shall forbid a director of class A of a Federal reserve bank, as defined in the Federal Reserve Act from being an officer or director or both an officer and director in one member bank.

That from and after two years from the date of the approval of this Act no person at the same time shall be a director in any two or more corporations, any one of which has capital, surplus, and undivided

profits aggregating more than \$1,000,000, engaged in whole or in part in commerce, other than banks, banking associations, trust companies and common carriers subject to the Act to regulate commerce, approved February fourth, eighteen hundred and eighty-seven, if such corporations are or shall have been theretofore, by virtue of their business and location of operation, competitors, so that the elimination of competition by agreement between them would constitute a violation of any of the provisions of any of the antitrust laws. The eligibility of a director under the foregoing provision shall be determined by the aggregate amount of the capital, surplus, and undivided profits, exclusive of dividends declared but not paid to stockholders, at the end of the fiscal year of said corporation next preceding the election of directors, and when a director has been elected in accordance with the provisions of this Act it shall be lawful for him to continue as such for one year thereafter.

When any person elected or chosen as a director or officer or selected as an employee of any bank or other corporation subject to the provisions of this Act is eligible at the time of his election or selection to act for such bank or other corporation in such capacity his eligibility to act in such capacity shall not be affected and he shall not become or be deemed amenable to any of the provisions hereof by reason of any change in the affairs of such bank or other corporation from whatsoever cause, whether specifically excepted by any of the provisions hereof or not, until the expiration of one year from the date of his election or employment.

SEC. 9. Every president, director, officer or manager of any firm, association or corporation engaged in commerce as a common carrier, who embezzles, steals, abstracts or willfully misapplies, or willfully permits to be misapplied, any of the moneys, funds, credits, securities, property or assets of such firm, association or corporation, arising or accruing from, or used in, such commerce, in whole or in part, or willfully or knowingly converts the same to his own use or to the use of another, shall be deemed guilty of a felony and upon conviction shall be fined not less than \$500 or confined in the penitentiary not less than one year nor more than ten years, or both, in the discretion of the court.

Prosecutions hereunder may be in the district court of the United States for the district wherein the offense may have been committed.

That nothing in this section shall be held to take away or impair the jurisdiction of the courts of the several States under the laws thereof; and a judgment of conviction or acquittal on the merits under the laws of any State shall be a bar to any prosecution hereunder for the same act or acts.

SEC. 10. That after two years from the approval of this Act no common carrier engaged in commerce shall have any dealings in securities, supplies or other articles of commerce, or shall make or have any contracts for construction or maintenance of any kind, to the amount of more than \$50,000, in the aggregate, in any one year, with another corporation, firm, partnership or association when the said common carrier shall have upon its board of directors or as its president, manager or as its purchasing or selling officer, or agent in the particular transaction, any person who is at the same time a director, manager, or purchasing or selling officer of, or who has any substantial interest in, such other corporation, firm, partnership or

association, unless and except such purchases shall be made from, or such dealings shall be with, the bidder whose bid is the most favorable to such common carrier, to be ascertained by competitive bidding under regulations to be prescribed by rule or otherwise by the Interstate Commerce Commission. No bid shall be received unless the name and address of the bidder or the names and addresses of the officers, directors and general managers thereof, if the bidder be a corporation, or of the members, if it be a partnership or firm, be given with the bid.

Any person who shall, directly or indirectly, do or attempt to do anything to prevent anyone from bidding or shall do any act to prevent free and fair competition among the bidders or those desiring to bid shall be punished as prescribed in this section in the case of an officer or director.

Every such common carrier having any such transactions or making any such purchases shall within thirty days after making the same file with the Interstate Commerce Commission a full and detailed statement of the transaction showing the manner of the competitive bidding, who were the bidders, and the names and addresses of the directors and officers of the corporations and the members of the firm or partnership bidding; and whenever the said commission shall, after investigation or hearing, have reason to believe that the law has been violated in and about the said purchases or transactions it shall transmit all papers and documents and its own views or findings regarding the transaction to the Attorney General.

If any common carrier shall violate this section it shall be fined not exceeding \$25,000; and every such director, agent, manager or officer thereof who shall have knowingly voted for or directed the act constituting such violation or who shall have aided or abetted in such violation shall be deemed guilty of a misdemeanor and shall be fined not exceeding \$5,000, or confined in jail not exceeding one year, or both, in the discretion of the court.

SEC. 11. That authority to enforce compliance with sections two, three, seven and eight of this Act by the persons respectively subject thereto is hereby vested: in the Interstate Commerce Commission where applicable to common carriers, in the Federal Reserve Board where applicable to banks, banking associations and trust companies, and in the Federal Trade Commission where applicable to all other character of commerce, to be exercised as follows:

Whenever the commission or board vested with jurisdiction thereof shall have reason to believe that any person is violating or has violated any of the provisions of sections two, three, seven and eight of this Act, it shall issue and serve upon such person a complaint stating its charges in that respect, and containing a notice of a hearing upon a day and at a place therein fixed at least thirty days after the service of said complaint. The person so complained of shall have the right to appear at the place and time so fixed and show cause why an order should not be entered by the commission or board requiring such person to cease and desist from the violation of the law so charged in said complaint. Any person may make application, and upon good cause shown may be allowed by the commission or board, to intervene and appear in said proceeding by counsel or in person. The testimony in any such proceeding shall be reduced to writing and filed in the office of the commission or board. If upon such hearing the com-

mission or board, as the case may be, shall be of the opinion that any of the provisions of said sections have been or are being violated, it shall make a report in writing in which it shall state its findings as to the facts, and shall issue and cause to be served on such person an order requiring such person to cease and desist from such violations, and divest itself of the stock held or rid itself of the directors chosen contrary to the provisions of sections seven and eight of this Act, if any there be, in the manner and within the time fixed by said order. Until a transcript of the record in such hearing shall have been filed in a circuit court of appeals of the United States, as hereinafter provided, the commission or board may at any time, upon such notice and in such manner as it shall deem proper, modify or set aside, in whole or in part, any report or any order made or issued by it under this section.

If such person fails or neglects to obey such order of the commission or board while the same is in effect, the commission or board may apply to the circuit court of appeals of the United States, within any circuit where the violation complained of was or is being committed or where such person resides or carries on business, for the enforcement of its order, and shall certify and file with its application a transcript of the entire record in the proceeding, including all the testimony taken and the report and order of the commission or board. Upon such filing of the application and transcript the court shall cause notice thereof to be served upon such person and thereupon shall have jurisdiction of the proceeding and of the question determined therein, and shall have power to make and enter upon the pleadings, testimony, and proceedings set forth in such transcript a decree affirming, modifying, or setting aside the order of the commission or board. The findings of the commission or board as to the facts, if supported by testimony, shall be conclusive. If either party shall apply to the court for leave to adduce additional evidence, and shall show to the satisfaction of the court that such additional evidence is material and that there were reasonable grounds for the failure to adduce such evidence in the proceeding before the commission or board, the court may order such additional evidence to be taken before the commission or board and to be adduced upon the hearing in such manner and upon such terms and conditions as to the court may seem proper. The commission or board may modify its findings as to the facts, or make new findings, by reason of the additional evidence so taken, and it shall file such modified or new findings, which, if supported by testimony, shall be conclusive, and its recommendation, if any, for the modification or setting aside of its original order, with the return of such additional evidence. The judgment and decree of the court shall be final, except that the same shall be subject to review by the Supreme Court upon certiorari as provided in section two hundred and forty of the Judicial Code.

Any party required by such order of the commission or board to cease and desist from a violation charged may obtain a review of such order in said circuit court of appeals by filing in the court a written petition praying that the order of the commission or board be set aside. A copy of such petition shall be forthwith served upon the commission or board, and thereupon the commission or board forthwith shall certify and file in the court a transcript of the record as

hereinbefore provided. Upon the filing of the transcript the court shall have the same jurisdiction to affirm, set aside, or modify the order of the commission or board as in the case of an application by the commission or board for the enforcement of its order, and the findings of the commission or board as to the facts, if supported by testimony, shall in like manner be conclusive.

The jurisdiction of the circuit court of appeals of the United States to enforce, set aside, or modify orders of the commission or board shall be exclusive.

Such proceedings in the circuit court of appeals shall be given precedence over other cases pending therein, and shall be in every way expedited. No order of the commission or board or the judgment of the court to enforce the same shall in any wise relieve or absolve any person from any liability under the antitrust Acts.

Complaints, orders, and other processes of the commission or board under this section may be served by anyone duly authorized by the commission or board, either (a) by delivering a copy thereof to the person to be served, or to a member of the partnership to be served, or to the president, secretary, or other executive officer or a director of the corporation to be served; or (b) by leaving a copy thereof at the principal office or place of business of such person; or (c) by registering and mailing a copy thereof addressed to such person at his principal office or place of business. The verified return by the person so serving said complaint, order, or other process setting forth the manner of said service shall be proof of the same, and the return post-office receipt for said complaint, order, or other process registered and mailed as aforesaid shall be proof of the service of the same.

SEC. 12. That any suit, action, or proceeding under the antitrust laws against a corporation may be brought not only in the judicial district whereof it is an inhabitant, but also in any district wherein it may be found or transacts business; and all process in such cases may be served in the district of which it is an inhabitant, or wherever it may be found.

SEC. 13. That in any suit, action, or proceeding brought by or on behalf of the United States subpoenas for witnesses who are required to attend a court of the United States in any judicial district in any case, civil or criminal, arising under the antitrust laws may run into any other district: *Provided*, That in civil cases no writ of subpoena shall issue for witnesses living out of the district in which the court is held at a greater distance than one hundred miles from the place of holding the same without the permission of the trial court being first had upon proper application and cause shown.

SEC. 14. That whenever a corporation shall violate any of the penal provisions of the antitrust laws, such violation shall be deemed to be also that of the individual directors, officers, or agents of such corporation who shall have authorized, ordered, or done any of the acts constituting in whole or in part such violation, and such violation shall be deemed a misdemeanor, and upon conviction therefor of any such director, officer, or agent he shall be punished by a fine of not exceeding \$5,000 or by imprisonment for not exceeding one year, or by both, in the discretion of the court.

SEC. 15. That the several district courts of the United States are hereby invested with jurisdiction to prevent and restrain violations of this Act, and it shall be the duty of the several district attorneys

of the United States, in their respective districts, under the direction of the Attorney General, to institute proceedings in equity to prevent and restrain such violations. Such proceedings may be by way of petition setting forth the case and praying that such violation shall be enjoined or otherwise prohibited. When the parties complained of shall have been duly notified of such petition, the court shall proceed, as soon as may be, to the hearing and determination of the case; and pending such petition, and before final decree, the court may at any time make such temporary restraining order or prohibition as shall be deemed just in the premises. Whenever it shall appear to the court before which any such proceeding may be pending that the ends of justice require that other parties should be brought before the court, the court may cause them to be summoned whether they reside in the district in which the court is held or not, and subpoenas to that end may be served in any district by the marshal thereof.

SEC. 16. That any person, firm, corporation, or association shall be entitled to sue for and have injunctive relief, in any court of the United States having jurisdiction over the parties, against threatened loss or damage by a violation of the antitrust laws, including sections two, three, seven and eight of this Act, when and under the same conditions and principles as injunctive relief against threatened conduct that will cause loss or damage is granted by courts of equity, under the rules governing such proceeding, and upon the execution of proper bond against damages for an injunction improvidently granted and a showing that the danger of irreparable loss or damage is immediate, a preliminary injunction may issue: *Provided*, That nothing herein contained shall be construed to entitle any person, firm, corporation, or association, except the United States, to bring suit in equity for injunctive relief against any common carrier subject to the provisions of the Act to regulate commerce, approved February fourth, eighteen hundred and eighty-seven, in respect of any matter subject to the regulation, supervision, or other jurisdiction of the Interstate Commerce Commission.

SEC. 17. That no preliminary injunction shall be issued without notice to the opposite party.

No temporary restraining order shall be granted without notice to the opposite party unless it shall clearly appear from specific facts shown by affidavit or by the verified bill that immediate and irreparable injury, loss, or damage will result to the applicant before notice can be served and a hearing had thereon. Every such temporary restraining order shall be indorsed with the date and hour of issuance, shall be forthwith filed in the clerk's office and entered of record, shall define the injury and state why it is irreparable and why the order was granted without notice, and shall by its terms expire within such time after entry, not to exceed ten days, as the court or judge may fix, unless within the time so fixed the order is extended for a like period for good cause shown, and the reasons for such extension shall be entered of record. In case a temporary restraining order shall be granted without notice in the contingency specified, the matter of the issuance of a preliminary injunction shall be set down for a hearing at the earliest possible time and shall take precedence of all matters except older matters of the same character;

and when the same comes up for hearing the party obtaining the temporary restraining order shall proceed with the application for a preliminary injunction, and if he does not do so the court shall dissolve the temporary restraining order. Upon two days' notice to the party obtaining such temporary restraining order the opposite party may appear and move the dissolution or modification of the order, and in that event the court or judge shall proceed to hear and determine the motion as expeditiously as the ends of justice may require.

Section two hundred and sixty-three of an Act entitled "An Act to codify, revise, and amend the laws relating to the judiciary," approved March third, nineteen hundred and eleven, is hereby repealed.

Nothing in this section contained shall be deemed to alter, repeal, or amend section two hundred and sixty-six of an Act entitled "An Act to codify, revise, and amend the laws relating to the judiciary," approved March third, nineteen hundred and eleven.

SEC. 18. That, except as otherwise provided in section 16 of this Act, no restraining order or interlocutory order of injunction shall issue, except upon the giving of security by the applicant in such sum as the court or judge may deem proper, conditioned upon the payment of such costs and damages as may be incurred or suffered by any party who may be found to have been wrongfully enjoined or restrained thereby.

SEC. 19. That every order of injunction or restraining order shall set forth the reasons for the issuance of the same, shall be specific in terms, and shall describe in reasonable detail, and not by reference to the bill of complaint or other document, the act or acts sought to be restrained, and shall be binding only upon the parties to the suit, their officers, agents, servants, employees, and attorneys, or those in active concert or participating with them, and who shall, by personal service or otherwise, have received actual notice of the same.

SEC. 20. That no restraining order or injunction shall be granted by any court of the United States, or a judge or the judges thereof, in any case between an employer and employees, or between employers and employees, or between employees, or between persons employed and persons seeking employment, involving, or growing out of, a dispute concerning terms or conditions of employment, unless necessary to prevent irreparable injury to property, or to a property right, of the party making the application, for which injury there is no adequate remedy at law, and such property or property right must be described with particularity in the application, which must be in writing and sworn to by the applicant or by his agent or attorney.

And no such restraining order or injunction shall prohibit any person or persons, whether singly or in concert, from terminating any relation of employment, or from ceasing to perform any work or labor, or from recommending, advising, or persuading others by peaceful means so to do; or from attending at any place where any such person or persons may lawfully be, for the purpose of peacefully obtaining or communicating information, or from peacefully persuading any person to work or to abstain from working; or from ceasing to patronize or to employ any party to such dispute, or from recommending, advising, or persuading others by peaceful and lawful means so to do; or from paying or giving to, or withholding from,

any person engaged in such dispute, any strike benefits or other moneys or things of value; or from peaceably assembling in a lawful manner, and for lawful purposes; or from doing any act or thing which might lawfully be done in the absence of such dispute by any party thereto; nor shall any of the acts specified in this paragraph be considered or held to be violations of any law of the United States.

SEC. 21. That any person who shall willfully disobey any lawful writ, process, order, rule, decree, or command of any district court of the United States or any court of the District of Columbia by doing any act or thing therein, or thereby forbidden to be done by him, if the act or thing so done by him be of such character as to constitute also a criminal offense under any statute of the United States, or under the laws of any State in which the act was committed, shall be proceeded against for his said contempt as hereinafter provided.

SEC. 22. That whenever it shall be made to appear to any district court or judge thereof, or to any judge therein sitting, by the return of a proper officer on lawful process, or upon the affidavit of some credible person, or by information filed by any district attorney, that there is reasonable ground to believe that any person has been guilty of such contempt, the court or judge thereof, or any judge therein sitting, may issue a rule requiring the said person so charged to show cause upon a day certain why he should not be punished therefor, which rule, together with a copy of the affidavit or information, shall be served upon the person charged, with sufficient promptness to enable him to prepare for and make return to the order at the time fixed therein. If upon or by such return, in the judgment of the court, the alleged contempt be not sufficiently purged, a trial shall be directed at a time and place fixed by the court: *Provided, however*, That if the accused, being a natural person, fail or refuse to make return to the rule to show cause, an attachment may issue against his person to compel an answer, and in case of his continued failure or refusal, or if for any reason it be impracticable to dispose of the matter on the return day, he may be required to give reasonable bail for his attendance at the trial and his submission to the final judgment of the court. Where the accused is a body corporate, an attachment for the sequestration of its property may be issued upon like refusal or failure to answer.

In all cases within the purview of this Act such trial may be by the court, or, upon demand of the accused, by a jury; in which latter event the court may impanel a jury from the jurors then in attendance, or the court or the judge thereof in chambers may cause a sufficient number of jurors to be selected and summoned, as provided by law, to attend at the time and place of trial, at which time a jury shall be selected and impaneled as upon a trial for misdemeanor; and such trial shall conform, as near as may be, to the practice in criminal cases prosecuted by indictment or upon information.

If the accused be found guilty, judgment shall be entered accordingly, prescribing the punishment, either by fine or imprisonment, or both, in the discretion of the court. Such fine shall be paid to the United States or to the complainant or other party injured by the act constituting the contempt, or may, where more than one is so damaged, be divided or apportioned among them as the court may direct, but in no case shall the fine to be paid to the United States

exceed, in case the accused is a natural person, the sum of \$1,000, nor shall such imprisonment exceed the term of six months: *Provided*, That in any case the court or a judge thereof may, for good cause shown, by affidavit or proof taken in open court or before such judge and filed with the papers in the case, dispense with the rule to show cause, and may issue an attachment for the arrest of the person charged with contempt; in which event such person, when arrested, shall be brought before such court or a judge thereof without unnecessary delay and shall be admitted to bail in a reasonable penalty for his appearance to answer to the charge or for trial for the contempt; and thereafter the proceedings shall be the same as provided herein in case the rule had issued in the first instance.

SEC. 23. That the evidence taken upon the trial of any persons so accused may be preserved by bill of exceptions, and any judgment of conviction may be reviewed upon writ of error in all respects as now provided by law in criminal cases, and may be affirmed, reversed, or modified as justice may require. Upon the granting of such writ of error, execution of judgment shall be stayed, and the accused, if thereby sentenced to imprisonment, shall be admitted to bail in such reasonable sum as may be required by the court, or by any justice, or any judge of any district court of the United States or any court of the District of Columbia.

SEC. 24. That nothing herein contained shall be construed to relate to contempts committed in the presence of the court, or so near thereto as to obstruct the administration of justice, nor to contempts committed in disobedience of any lawful writ, process, order, rule, decree, or command entered in any suit or action brought or prosecuted in the name of, or on behalf of, the United States, but the same, and all other cases of contempt not specifically embraced within section twenty-one of this Act, may be punished in conformity to the usages at law and in equity now prevailing.

SEC. 25. That no proceeding for contempt shall be instituted against any person unless begun within one year from the date of the act complained of; nor shall any such proceeding be a bar to any criminal prosecution for the same act or acts; but nothing herein contained shall affect any proceedings in contempt pending at the time of the passage of this Act.

SEC. 26. If any clause, sentence, paragraph, or part of this Act shall, for any reason, be adjudged by any court of competent jurisdiction to be invalid, such judgment shall not affect, impair, or invalidate the remainder thereof, but shall be confined in its operation to the clause, sentence, paragraph, or part thereof directly involved in the controversy in which such judgment shall have been rendered.

Approved, October 15, 1914.

Exhibit D.—REPORTS ISSUED BY THE BUREAU.

ANNUAL REPORTS.

These consist of brief statements of the character of the Bureau's administrative work for the year for which each report is made, statements as to fiscal affairs, appropriations, personnel of Bureau, and discussions of general questions of policy. They are small pamphlets

and do not discuss any particular industry or corporation, nor facts intended to be covered by special reports.

Annual Report of the Commissioner of Corporations for 1904. 71 pp.

Same, 1905. 8 pp.
 Same, 1906. 7 pp.
 Same, 1907. 7 pp.
 Same, 1908. 10 pp.
 Same, 1909. 8 pp.
 Same, 1910. 7 pp.
 Same, 1911. 6 pp.
 Same, 1912. 24 pp.
 Same, 1913. 8 pp.
 Same, 1914. 47 pp.

SPECIAL REPORTS ON INVESTIGATIONS.

Report on the Beef Industry, Mar. 3, 1905. xxxvi+315 pp., 15 diags. 1905.

Chap. I. General description of the slaughtering and packing industry.
 Chap. II. Organization and capitalization of the large packing companies.
 Chap. III. Proportion of the beef business of the United States controlled by the six leading packing companies.
 Chap. IV. Comparison of the prices of cattle and of dressed beef.
 Chap. V. Profits of the beef industry.
 Chap. VI. Private car lines of the large packing houses.

Report on the Transportation of Petroleum, May 2, 1906. xxvii+512 pp., 40 maps and diags. 1906.

Chap. I. General conditions of oil transportation.
 Chap. II. Middle Atlantic States.
 Chap. III. Atlantic coast territory. New England.
 Chap. IV. North Central States.
 Chap. V. Western and Northwestern States.
 Chap. VI. South Central States.
 Chap. VII. Southwestern States.
 Chap. VIII. Kansas-territory field.
 Chap. IX. California.

This report disclosed numerous and flagrant discriminations by railroads in favor of Standard Oil Co. and its affiliated corporations in transporting petroleum, by secret rates, by discriminations in open arrangement of rates, in classification and rules of shipment, and in treatment of private tank cars.

Report on the Petroleum Industry. Part I: Position of the Standard Oil Co. in the Petroleum Industry, May 20, 1907. xxi+396 pp., 8 maps. 1907.

Chap. I. Introduction.
 Chap. II. History and organization of the Standard Oil Co.
 Chap. III. Production of crude oil.
 Chap. IV. Description of pipe lines and proportion controlled by the Standard Oil Co.
 Chap. V. Effect of the Standard's pipe line monopoly.
 Chap. VI. Cost of pipe-line transportation in comparison with pipe-line rates.
 Chap. VII. Refining of oil.
 Chap. VIII. Control of marketing and marketing facilities.

Report on the Petroleum Industry. Part II: Prices and Profits, Aug. 5, 1907. xiv+965 pp., 3 maps, 71 diags. 1907.

Chap. I. Introduction.
 Chap. II. Crude-oil prices.
 Chap. III. Prices of illuminating oil.
 Chap. IV. Margins between prices of illuminating oil and crude oil.
 Chap. V. Prices of by-products, and margins.
 Chap. VI. Margin between prices of crude petroleum and petroleum products in general.
 Chap. VII. Relative movement of foreign and domestic oil prices.

- Chap. VIII. Comparison of absolute level of foreign and domestic prices.
- Chap. IX. General criticism of export policy of Standard Oil Co.
- Chap. X. Discrimination in illuminating-oil prices among States and sections.
- Chap. XI. Discrimination in illuminating-oil prices among towns.
- Chap. XII. Discrimination in prices of gasoline.
- Chap. XIII. Profits of the Standard Oil Co.
- Chap. XIV. Costs and profits for individual Standard refineries.
- Chap. XV. Real sources of the Standard's domination.
- Chap. XVI. Prices paid by railroads for lubricating oils.

Report on Cotton Exchanges. Part I: Methods of Establishing Grade Differences for Future Contracts, May 4, 1908. xxi+369 pp., 11 charts. 1908.

- Chap. I. General nature of future trading and functions of cotton exchanges.
- Chap. II. Nature of future contracts in cotton.
- Chap. III. Effect of errors in differences on parity between spot and contract prices.
- Chap. IV. Periodic versus commercial differences with respect to the parity between spot and contract prices.
- Chap. V. Charges of intentional abuse of power by revision committees.
- Chap. VI. Other complaints against periodic-difference system.
- Chap. VII. Attempted defenses of periodic-difference system.
- Chap. VIII. Abuses charged against commercial-difference system.
- Chap. IX. Proposed changes in methods of establishing differences at New York.

Same. [One volume, two parts.] Part II: Classification of Cotton. Part III: Range of Grades Deliverable on Contract. May 29, 1908. xvi+217 pp., 1 illus. 1908.

Part II. Classification of Cotton—

- Chap. I. Complaints against character of New York stock and of over-classification.
- Chap. II. Alleged severity of New Orleans classification.
- Chap. III. Discussion of suggested changes in methods of classification.
- Chap. IV. Practicability of a uniform standard of classification.

Part III. Range of Grades deliverable on Contract—

- Chap. I. General Arguments for and against present broad contract.
- Chap. II. Suggested specific changes in range of contract grades.

Same. [One volume, two parts.] Part IV: Effect of Future Contracts on Prices of Cotton. Part V: Influence of Producers' Organizations on Prices of Cotton. Dec. 6, 1909. xxii+362 pp., 24 charts. 1909.

Part IV. Effect of Future Contracts on Prices of Cotton—

- Chap. I. Effect of abnormal discounts of future prices on spot prices in central markets.
- Chap. II. Effect of abnormal discounts in future prices upon prices paid cotton producers.
- Chap. III. Disastrous effect of abnormal discounts in future prices upon hedging operations.
- Chap. IV. Fallacy of the contention that the New York Cotton Exchange must have a "calculable" contract.
- Chap. V. Permanent differences.
- Chap. VI. Analysis of complaints against commercial-difference system.
- Chap. VII. Duty of New York Cotton Exchange to adopt commercial-difference system.
- Chap. VIII. Conflicting views of the influence of speculation upon spot prices of cotton.
- Chap. IX. Fluctuations in cotton prices before and since introduction of future trading.

Part V. Influence of Producers' Organizations on Prices of Cotton—

- Chap. I. Description of principal organizations.
- Chap. II. Efforts of producers' organizations to reduce acreage.
- Chap. III. Efforts of producers' organizations to maintain prices of cotton.

Report on the Tobacco Industry. Part I: Position of the Tobacco Combination in the Industry, Feb. 25, 1909. xxiii+489 pp. 1909.

Chap. I. Introduction.

Chap. II. History of the American Tobacco Co. to the time of the merger of 1904.

Chap. III. History of the Continental Tobacco Co.

Chap. IV. History of the Consolidated Tobacco Co.

Chap. V. Merger of October, 1904, and subsequent history of the American Tobacco Co.

Chap. VI. History of the American Snuff Co.

Chap. VII. History of the American Cigar Co.

Chap. VIII. History of the foreign interests of the Tobacco Combination.

Chap. IX. Tabular presentation of the acquisitions of the Combination from 1890 to 1906.

Chap. X. General description of the Tobacco Combination, 1906.

Chap. XI. Present organization and business of the American Tobacco Co. group.

Chap. XII. Present organization and business of the snuff-manufacturing group.

Chap. XIII. Present organization and business of the cigar-manufacturing group.

Chap. XIV. Present organization and business of the British-American Tobacco Co.

Chap. XV. Present organization and business of the distributing companies of the Combination.

Chap. XVI. The Combination's control of tobacco manufacture, 1906.

Chap. XVII. Changes in the Combination's proportion of the cigarette output, 1890-1906.

Chap. XVIII. Development of the Combination's control of smoking and chewing tobacco and snuff, 1890-1906.

Chap. XIX. Development of the Combination's control of plug tobacco, 1890-1906.

Chap. XX. Development of the Combination's control of smoking tobacco, 1890-1906.

Chap. XXI. Development of the Combination's control of snuff, 1891-1906.

Chap. XXII. Growth of the Combination's control of fine-cut tobacco, 1891-1906.

Chap. XXIII. Development of the Combination's cigar business.

Same. Part II: Capitalization, Investment, and Earnings, Sept. 25, 1911. xxi+343 pp. 1911.

Chap. I. General introduction.

Chap. II. Reported capitalization and earnings of the original American, Continental, Consolidated, reorganized American, and Lorillard companies as shown on companies' books.

Chap. III. Analysis of tangible assets of the American, Continental, and Lorillard companies in directly conducted business.

Chap. IV. Analysis of cost of the good will of the American, Continental, and Lorillard companies.

Chap. V. Combined investment of American, Continental, and Lorillard companies in directly conducted business.

Chap. VI. Combined earnings of American, Continental, and Lorillard companies in directly conducted business.

Chap. VII. Comparison of earnings and investment of American, Continental, and Lorillard companies in directly conducted business.

Chap. VIII. Investment and earnings of subsidiary concerns making cigarettes, manufactured tobacco, and contributory products.

Chap. IX. Combined investment and earnings of the parent and subsidiary companies in directly conducted business.

Chap. X. Investment and earnings in the snuff branch of the Combination's business.

Chap. XI. Investment and earnings in the cigar branch of the Combination's business.

Chap. XII. Miscellaneous investment and income—Grand total investment and income of the Tobacco Combination.

Chap. XIII. Rates of profit in independent tobacco business.

Reports on Taxation of Corporations.

These reports discuss the systems of taxing manufacturing, mercantile, transportation, and transmission corporations in the United States. Each part is devoted to a certain geographical group of States.

Part I. New England: The States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. May 17, 1909. xiii+156 pp. 1909.

Part II. Middle Atlantic States: New York, New Jersey, Pennsylvania, Delaware, Maryland, and the District of Columbia. June 6, 1910. xiii+115 pp. 1910.

Part III. Eastern Central States: Ohio, Indiana, Illinois, Michigan, and Wisconsin. July 31, 1911. x+109 pp. 1911.

Part IV. Western Central States: Minnesota, North Dakota, South Dakota, Iowa, Nebraska, Kansas, and Missouri. Nov. 29, 1912. xiii+144 pp. 1912.

Part V. Mountain and Pacific States: Montana, Idaho, Wyoming, Colorado, Utah, Nevada, Arizona, New Mexico, Washington, Oregon, and California. Sept. 8, 1914. xiii+228 pp. 1914.

In all of these taxation reports the same general outline of treatment is followed. In the introduction to each Part certain general features of taxation are discussed, applicable either to the geographical group covered by the report or comparisons with other States than those covered by that particular Part. Then follows an abstract of the leading facts for each State covered by the Part in question, mentioning prominent and particular matters applicable to the State. After this is set forth the system of each State according to the following outline: General view, constitutional provisions, statutes, financial results, comments, and bibliography.

Special Report on Taxation, Supplementing Previous Reports on the Taxation of Corporations and Covering the Tax Movement Throughout the United States during 1912. Dec. 29, 1913. xxxviii+421 pp. 1913.

Chap. I. Introduction.

Chap. II. Legislation—Changes effected in the taxation of corporations since the publication of the Bureau's Reports on the Taxation of Corporations, Parts I, II, III, and IV.

Chap. III. Judicial decisions in 1912.

Chap. IV. Reports of tax conferences, special and permanent tax commissions.

Chap. V. Constitutional amendments and referendum legislation on taxation.

Report on Transportation by Water in the United States. Part I: General Conditions of Transportation by Water, July 12, 1909. xviii+614 pp., 1 map. 1909.

Chap. I. Waterways and their improvement.

Chap. II. The equipment employed in transportation by water.

Chap. III. Business organization.

Chap. IV. Shipping contracts and documents, and some legal aspects thereof.

Chap. V. Marine insurance.

Chap. VI. The taxation of vessel property and of navigation companies.

Same. Part II: Water-Borne Traffic, July 19, 1909. xxiv+402 pp., 5 maps. 1909.

Chap. I. Introduction.

Chap. II. Atlantic and Gulf coasts—General conditions.

Chap. III. North Atlantic ports, rivers, and canals.

Chap. IV. South Atlantic ports and rivers.

Chap. V. Gulf ports and rivers.

Chap. VI. Great Lakes—Movement of commodities.

Chap. VII. Great Lakes—Traffic by lakes and ports.

Chap. VIII. Mississippi River and tributaries.

Chap. IX. Pacific coast and rivers.

Same. Part III: Water Terminals, Sept. 26, 1910. xxi+436 pp., 18 charts and diags. 1910.

Chap. I. Introduction—

General characteristics.

Legal principles.

Chap. II. Atlantic and Gulf ports.

Chap. III. Ports on the Great Lakes.

Chap. IV. Ports of the Mississippi River system.

Chap. V. Ports on the Pacific coast and rivers.

Chap. VI. Control of wharf property by vessel owners—

Railroad control of water-front property through control of boat lines.

Wharf property of water lines uncontrolled by railroads.

Terminal facilities of bulk carriers.

Chap. VII. Storage facilities and handling equipment.

Chap. VIII. Port and terminal charges.

Same. Part IV: Control of Water Carriers by Railroads and by Shipping Consolidations, Dec. 23, 1912. xvii+89 pp., 4 maps. 1913.

Chap. I. Nature and extent of control.

Chap. II. Railroad control of water carriers.

Chap. III. Railroad control of canals and their traffic.

Chap. IV. Steamship consolidations.

Report on the Steel Industry. Part I: Organization, Investment, Profits, and Position of United States Steel Corporation, July 1, 1911. xxiv+422 pp. 1911.

Chap. I. The consolidation movement in the steel industry.

Chap. II. Analysis of investment of constituent companies of United States Steel Corporation.

Chap. III. Valuation of tangible property of the Steel Corporation in 1901 by departments of its business.

Chap. IV. Summary of evidence of excessive issue of securities by United States Steel Corporation in 1901.

Chap. V. Principal acquisitions of property by the Steel Corporation since 1901.

Chap. VI. Additions to investment of United States Steel Corporation since 1901.

Chap. VII. Profits of the Steel Corporation compared with its investment.

Chap. VIII. The bond-conversion plan of 1902-3.

Chap. IX. Relative position of the United States Steel Corporation in the steel industry.

Same. Part II: Cost of Production, Jan. 22, 1912. xviii+144 pp. 1912. [Preliminary report.]

Chap. I. Summary of results.

Chap. II. The cost problem and scope of report.

Chap. III. Average book costs of chief raw materials and products of iron and steel, 1902-1906.

Chap. IV. Methods of eliminating intermediate transfer profits from book costs.

Chap. V. Comparison of book costs for 1902-1906 with costs after elimination of intermediate transfer profits.

Chap. VI. Comparison of 1902-1906 costs with present costs.

Chap. VII. Costs of the Steel Corporation in 1910.

Chap. VIII. Approximate investment in raw materials, plants, and working capital required to produce a ton of Bessemer steel rails from lake ores.

Chap. IX. Important bearing of ore profits upon costs and profits for finished products, and upon competition.

Same. Part III: Cost of Production: Full Report. May 6, 1913. xxxiv+569 pp. 1913.

Chap. I. Introduction and summary.

Chap. II. Introduction to book costs, 1902-1906.

Chap. III. Book cost of iron ore, 1902-1906.

Chap. IV. Book cost of coke, 1902-1906.

Chap. V. Book cost of pig iron, 1902-1906.

Chap. VI. Book cost of steel ingots, 1902-1906.

Chap. VII. Book costs of rolled products, 1902-1906.

Chap. VIII. Introduction to revised costs, 1902-1906.

Chap. IX. Revised costs, 1902-1906.

Chap. X. Steel Corporation's ore transportation profits, 1902-1906.

Chap. XI. Comparison of 1902-1906 costs with present costs.

Chap. XII. Movement of net costs of chief raw materials and selected products of iron and steel, 1901-1910.

Chap. XIII. Steel Corporation's book costs and integration costs and relation to investment.

- Chap. XIV. Steel Corporation's integration costs of Lake Superior ore for 1910.
- Chap. XV. Steel Corporation's integration costs of coke for 1910.
- Chap. XVI. Steel Corporation's integration costs of pig iron for 1910.
- Chap. XVII. Steel Corporation's integration costs of ingots for 1910.
- Chap. XVIII. Steel Corporation's integration costs of heavy rolled products for 1910.
- Chap. XIX. Summary of Steel Corporation's integration costs for 1910, excluding and including transportation profits.
- Chap. XX. Introduction to investment and profit.
- Chap. XXI. Investment and profit in lake ore mining and transportation and relations to cost of steel products and to conditions of competition.
- Chap. XXII. Investment and profit, by products, 1902-1906.
- Chap. XXIII. Investment and profit, by products, of the Steel Corporation, 1910.

Report on the Lumber Industry. Part I: Standing Timber, Jan. 20, 1913. xxiii+286 pp., 2 maps. 1913.

- Chap. I. Introduction.
- Chap. II. Supply of standing timber in the United States.
- Chap. III. Concentration of timber ownership—
 - Concentration of ownership in entire investigation area.
 - Concentration of ownership in the several States of the investigation area and on the Pacific coast.
- Chap. IV. Acreage of timber holdings.
- Chap. V. Value of standing timber.
- Chap. VI. Public-land policy a primary cause of concentration of timber ownership—
 - Land grants.
 - General land laws.

Preceding the above report, the Bureau on February 13, 1911, issued a summary of this Part I on Standing Timber. This summary, revised in a few particulars, appears in the full text of Part I.

Same. [One volume, two parts.] Part II: Concentration of Timber Ownership in Important Selected Regions. Part III: Land Holdings of Large Timber Owners. July 13, 1914. xx+236 pp., 8 maps. 1914.

Part II. Concentration of Timber Ownership in Important Selected Regions—

- Chap. I. Introduction.
- Chap. II. Concentration of timber ownership in southwestern Washington.
- Chap. III. Concentration of timber ownership in important areas in western Oregon.
- Chap. IV. Concentration of timber ownership in northeastern California and in the redwood belt.
- Chap. V. Concentration of timber ownership in north central Idaho.
- Chap. VI. Concentration of timber ownership in west central Louisiana.

Part III. Land Holdings of Large Timber Owners—

- Chap. I. Introduction.
- Chap. II. Land owned in investigation area by large timber owners.
- Chap. III. Concentration of land ownership in Upper Peninsula of Michigan.
- Chap. IV. Large land holdings in Florida.

Same. Part IV: Conditions in Production and Wholesale Distribution, Including Wholesale Prices. Apr. 21, 1914. xxi+925 pp. 1914.

- Chap. I. Introduction.
- Chap. II. Cooperation among manufacturers' associations.
- Chap. III. Southern yellow pine.
- Chap. IV. Douglas fir.
- Chap. V. White and "northern" pine.
- Chap. VI. Hemlock.
- Chap. VII. Spruce.
- Chap. VIII. Cypress.
- Chap. IX. Shingles.
- Chap. X. Hardwoods.

Special Report on Present and Past Conditions in the Lumber and Shingle Industry in the State of Washington. Feb. 18, 1914. 43 pp. 1914.

Production.

General conditions under which shingles are produced.

Market conditions.

Conditions referred to by Representative Humphrey.

Close-down campaign among shingle manufacturers in the fall of 1913.

Conditions in 1912.

Closing of the shingle mills in 1911 and previous years

Causes leading to close down in December, 1913.

Effect of the removal of the duty on shingles.

Effect of timber and logging conditions on the shingle industry.

Cost of shingle production in the United States and in Canada.

The unemployed in December, 1913.

Fluctuations in the price of red cedar shingles.

Conditions in the lumber industry.

Report on Water-Power Development in the United States. [One volume, three parts.] Mar. 14, 1912. xx+220 pp., 16 maps and charts. 1912.

Part I. Physical conditions and economic aspects of water power—

Chap. I. Power demand.

Chap. II. Potential water power in the United States.

Chap. III. Developed water power in the United States.

Chap. IV. Some physical and economic problems of water power.

Part II. Concentration of ownership and control—

Chap. I. Forces that have contributed toward concentration.

Chap. II. Concentration in localities.

Chap. III. Concentration of ownership and control, grouped by interests.

Chap. IV. Relation of water-power companies to municipal public-service corporations.

Part III. Water power and the public—

Chap. I. Public ownership or control.

Chap. II. Relation of water power to the public.

Report on Cotton Tare, Sept. 3, 1912. x+53 pp. 1912.

Introductory.

Methods of packing and handling cotton.

Cotton bagging.

Tare rules of cotton exchanges and cotton markets in the United States.

New Orleans Cotton Exchange.

New York Cotton Exchange.

Other American exchanges and markets.

Tare rules adopted by American cotton spinners.

Tare rules of European markets.

Purpose and effect of "c. i. f. and 6 per cent" contract.

Overtare.

Effect of the c. i. f. and 6 per cent contract on the American exporter.

Effect of tare allowances on the price paid the producer.

Remedies proposed for tare evils.

Practicability of compressing cotton at the gin.

Economic advantages in using less tare.

Cotton sold on a false-weight basis.

Attitude of the cotton trade toward changing existing tare customs.

Report on the International Harvester Company. Mar. 3, 1913. xxiii+384 pp. 1913.

Summary.

Chap. I. Conditions before the formation of the International Harvester Co.

Chap. II. Formation of the International Harvester Co.

Chap. III. Comparison of capitalization and investment in 1902.

Chap. IV. Subsequent development of the International Harvester Co.

Chap. V. Profits and prices of the International Harvester Co.

Chap. VI. Productive efficiency and financial resources.

Chap. VII. Competitive methods of the International Harvester Co.

MISCELLANEOUS REPORTS.

Statement of the Commissioner of Corporations in answer to the allegations of the Standard Oil Co. concerning its conviction at Chicago for accepting concessions on shipments over the Chicago & Alton R. R. A discussion of the allegations in the pamphlet entitled "From the Directors of the Standard Oil Company to its employees and stockholders," Dec. 30, 1907. 11 pp. 1907.

Interstate Commerce Law as changed by the act of June 29, 1906.

This compilation is a parallel-column comparison between the provisions of the act of February 4, 1887, in full as in force prior to June 29, 1906, and the provisions of the act of June 29, 1906. The Bureau has published nothing further regarding laws relating to either interstate commerce or the Interstate Commerce Commission.

Report of the Secretary of Commerce and Labor concerning patents granted to officers and employees of the Government. [Under the Provisions of Public Resolution No. 15, approved by the President Feb. 18, 1907.] 74 pp.

The Secretary of Commerce and Labor directed the Commissioner of Corporations to conduct this inquiry, and the report on the resolution was transmitted by the Secretary of Commerce and Labor to the Speaker of the House of Representatives May 5, 1908. The document was not printed or distributed as a Department or Bureau report. It was published by the House of Representatives, Sixtieth Congress, first session, as House Document No. 914. It may be procured from the Superintendent of Documents, Washington, D. C.

Report of the Commissioner of Corporations on certain features of the concentration of water powers.

Accompanies special message of President Roosevelt vetoing House bill No. 17707, authorizing construction of a dam across James River, in Stone County, Mo. Published as House Document No. 1350, Sixtieth Congress, second session. This pamphlet was not published or distributed by the Bureau of Corporations. It may be procured from the Superintendent of Documents, Washington, D. C.

Report on the Prices of Tobacco transmitted in response to Senate Resolution No. 44, of May 14, 1909. 181 pp. 14 diag. Published as Senate Document No. 78, Sixty-first Congress, first session.

This was a special report made in pursuance of a specific resolution of the Senate, and transmitted to the Senate on June 5, 1909. The Bureau of Corporations did not print this report, and has none for distribution. It may be procured from the Superintendent of Documents, Washington, D. C. The report covers the general subject of prices and profits of the Tobacco Combination.

A more elaborate report by the Bureau of Corporations on the same general subject is in the press.

Exhibit E.—EXPENDITURES OF THE BUREAU.

DETAILED STATEMENT OF EXPENDITURES FROM APPROPRIATIONS OF THE BUREAU OF CORPORATIONS FROM ITS ORGANIZATION IN 1903 TO JUNE 30, 1914, SHOWING YEARLY COST OF THE VARIOUS INVESTIGATIONS CONDUCTED BY THE BUREAU, TOGETHER WITH ADMINISTRATIVE (COSTS, BY FISCAL YEARS.

The Bureau does not allocate to the various investigations administrative expenses, nor annual and sick leave, all of which are, with certain other administrative expenses, kept separately. The cost of furniture, supplies, rent, and certain contingent expenses, which are paid out of the Department's contingent expense account, are not included, nor the cost of printing the Bureau's reports.]

| Items. | 1903-4 | 1904-5 | 1905-6 | 1906-7 | 1907-8 | 1908-9 | 1909-10 | 1910-11 | 1911-12 | 1912-13 | 1913-14 | Total. |
|--|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|
| Administration: | | | | | | | | | | | | |
| Office..... | \$5,191.54 | \$16,579.19 | \$17,672.16 | \$19,191.70 | \$16,562.91 | \$16,949.70 | \$22,137.82 | \$20,532.47 | \$20,187.93 | \$18,919.00 | \$23,529.83 | \$197,454.25 |
| Field..... | | | | 483.58 | 507.43 | 385.24 | 54.37 | 40 | 110.27 | | 26.20 | 1,577.49 |
| Accounts..... | | 2,773.41 | 3,148.99 | 2,472.57 | 3,219.86 | 3,715.45 | 3,876.85 | 3,488.73 | 3,711.30 | 3,867.07 | 3,799.86 | 34,086.09 |
| Filing and indexing..... | 2,572.30 | 4,325.84 | 5,795.19 | 6,520.18 | 7,503.52 | 8,754.99 | 10,277.65 | 10,996.76 | 9,832.64 | 9,811.03 | 9,260.55 | 86,650.95 |
| Messenger service..... | | 2,234.11 | 2,269.80 | 2,278.71 | 2,683.30 | 2,746.86 | 2,772.28 | 2,666.31 | 2,660.67 | 2,718.26 | 2,662.02 | 26,742.32 |
| Annual leave..... | 1,715.10 | 6,025.86 | 7,806.93 | 8,832.06 | 10,096.61 | 13,162.45 | 12,218.45 | 13,413.84 | 14,427.29 | 13,950.00 | 13,979.15 | 115,627.74 |
| Sick leave..... | 303.76 | 1,219.14 | 1,180.61 | 2,147.99 | 1,477.71 | 2,344.81 | 2,109.62 | 3,513.31 | 2,818.39 | 2,821.45 | 2,187.37 | 22,124.16 |
| Awaiting orders..... | | | 631.62 | 454.87 | 1,424.86 | 2,106.25 | 724.60 | 2,923.90 | 1,272.78 | 810.39 | 206.91 | 10,576.18 |
| Details to other bureaus..... | 10,246.25 | 10,489.78 | 1,854.07 | 543.68 | 2,888.08 | 3,887.61 | 482.58 | 2,359.58 | 4,963.77 | 8,722.32 | 6,005.78 | 52,443.48 |
| Total..... | \$9,098.96 | \$3,697.51 | \$0,379.57 | \$2,835.34 | \$6,355.28 | \$1,053.36 | \$1,654.22 | \$9,865.90 | \$9,985.04 | \$1,619.52 | \$1,957.87 | \$49,261.68 |
| Miscellaneous legal, etc: | | | | | | | | | | | | |
| Office..... | 8,028.82 | 10,072.36 | 3,119.83 | 1,919.88 | 1,534.64 | 387.48 | 1,024.18 | 3,250.29 | 3,344.06 | 171.99 | 3,835.56 | 36,687.09 |
| Field..... | | | | 129.80 | 870.52 | | | | | | | 1,000.32 |
| Total..... | 8,098.82 | 10,072.36 | 3,119.83 | 2,049.68 | 2,405.16 | 387.48 | 1,024.18 | 3,250.29 | 3,344.06 | 171.99 | 3,835.56 | 37,687.41 |
| Beet investigation: | | | | | | | | | | | | |
| Office..... | 2,641.61 | 16,374.67 | 1,832.43 | 321.86 | | | | | | | | 21,170.57 |
| Field..... | 7,076.16 | 12,341.71 | 2,872.80 | | | | | | | | | 22,290.17 |
| Total..... | 9,717.77 | \$8,716.38 | 4,704.71 | 321.86 | | | | | | | | \$43,460.74 |
| Beet-sugar investigation: | | | | | | | | | | | | |
| Office..... | | | | | | | | | | | 3,791.01 | 3,791.01 |
| Field..... | | | | | | | | | | | 12,177.39 | 12,177.39 |
| Total..... | | | | | | | | | | | 15,968.40 | 15,968.40 |
| Cotton exchanges investigation: | | | | | | | | | | | | |
| Office..... | | | | 578.82 | 7,425.88 | 2,116.71 | 3,940.62 | 20.05 | | | | 14,082.08 |
| Field..... | | | | 2,432.77 | 2,612.61 | 1,119.24 | 381.48 | | | | | 6,537.10 |
| Total..... | | | | 3,011.59 | 10,038.49 | 3,235.96 | 4,322.10 | \$0.06 | | | | \$0,619.18 |

DETAILED STATEMENT OF EXPENDITURES FROM APPROPRIATIONS OF THE BUREAU OF CORPORATIONS FROM ITS ORGANIZATION IN 1903 TO JUNE 30, 1914, SHOWING YEARLY COST OF THE VARIOUS INVESTIGATIONS CONDUCTED BY THE BUREAU, TOGETHER WITH ADMINISTRATIVE COSTS, BY FISCAL YEARS—Continued.

| Items. | 1903-4 | 1904-5 | 1905-6 | 1906-7 | 1907-8 | 1908-9 | 1909-10 | 1910-11 | 1911-12 | 1912-13 | 1913-14 | Total. |
|---|-----------|------------|-----------|-----------|-----------|------------|------------|-------------|-------------|------------|-------------|-------------|
| Efficiency-of-trusts investigation: | | | | | | | | | | | | |
| Office..... | | | | | | | | | | | \$18,880.29 | \$18,880.29 |
| Field..... | | | | | | | | | | | 3,507.37 | 3,507.37 |
| Total..... | | | | | | | | | | | \$21,387.66 | \$21,387.66 |
| Fertilizer investigation: | | | | | | | | | | | | |
| Office..... | | | | | | | | | | | 7,312.05 | 8,331.25 |
| Field..... | | | | | | | | | | | 4,983.36 | 4,983.36 |
| Total..... | | | | | | | | | | \$1,019.80 | 12,297.41 | 13,316.61 |
| International Harvester and farm machinery associations investigation: | | | | | | | | | | | | |
| Office..... | | | | \$47.20 | \$553.34 | \$2,590.15 | \$7,691.04 | \$12,155.06 | \$14,393.34 | 10,731.14 | 5,154.75 | 59,225.92 |
| Field..... | | | | 59.95 | 508.50 | 3,646.91 | 13,576.98 | 7,379.59 | 15,185.82 | 5,313.78 | 1,196.54 | 46,955.87 |
| Total..... | | | | 107.15 | 1,059.84 | 6,237.06 | 21,268.02 | 19,534.65 | 29,579.16 | 22,044.92 | 6,351.29 | 106,181.79 |
| Lumber investigation: | | | | | | | | | | | | |
| Office..... | | | \$16.83 | 1,300.93 | 12,560.11 | 26,164.43 | 29,393.36 | 43,268.36 | 37,479.79 | 43,396.92 | 20,292.64 | 213,963.37 |
| Field..... | | | | 4,493.46 | 51,441.20 | 42,462.86 | 53,089.44 | 10,590.27 | 12,035.20 | 18,698.08 | 5,677.87 | 188,458.47 |
| Total..... | | | 16.83 | 5,794.39 | 63,001.40 | 68,627.29 | 82,482.80 | 53,858.63 | 49,514.99 | 62,095.00 | 26,970.51 | 392,421.84 |
| Oil investigation: | | | | | | | | | | | | |
| Office..... | \$557.12 | \$7,190.00 | 30,304.25 | 28,335.03 | 8,500.05 | 5,126.36 | 807.24 | 834.01 | 752.02 | 115.78 | 316.46 | \$2,827.32 |
| Field..... | | 10,937.24 | 25,348.25 | 13,693.00 | 4,457.50 | 6,509.47 | 141.70 | 516.43 | 475.51 | 142.56 | 768.14 | \$2,073.80 |
| Total..... | 557.12 | 17,828.24 | 55,652.50 | 41,998.03 | 12,957.55 | 11,634.83 | 948.94 | 1,350.44 | 1,227.53 | 258.34 | 1,084.60 | 144,901.12 |
| Oklahoma oil investigation: | | | | | | | | | | | | |
| Office..... | | | | | | | | | | | 5,150.32 | 5,150.32 |
| Field..... | | | | | | | | | | | 3,208.53 | 3,208.53 |
| Total..... | | | | | | | | | | | 8,358.85 | 8,358.85 |
| Reindeer price investigation: | | | | | | | | | | | | |
| Office..... | | | | | | | | | | | 1,990.12 | 1,990.12 |
| Field..... | | | | | | | | | | | 2,193.25 | 2,193.25 |
| Total..... | | | | | | | | | | | 4,183.37 | 4,183.37 |
| State and Federal Incorporation laws: | | | | | | | | | | | | |
| Office..... | 3,988.04 | 4,891.24 | 3,696.59 | 3,517.95 | 2,594.72 | 12,998.90 | | | | | | 31,559.44 |
| Field..... | 6,637.82 | 2,937.57 | | | | 406.14 | | | | | | 10,001.53 |
| Total..... | 10,625.86 | 7,828.81 | 3,696.59 | 3,517.95 | 2,594.72 | 13,405.04 | | | | | | 41,560.97 |
| Steel investigation: | | | | | | | | | | | | |
| Office..... | 2,084.38 | 1,069.45 | 3,401.80 | 6,535.58 | 16,735.11 | 18,732.52 | 15,072.68 | 10,718.80 | 13,062.04 | 10,308.15 | 43.66 | 97,714.17 |
| Field..... | | | 710.62 | 1,339.23 | 6,406.62 | 2,373.75 | | 150.60 | 871.71 | 892.98 | | 13,280.35 |
| Total..... | 2,084.38 | 1,069.45 | 4,112.42 | 7,874.81 | 23,140.73 | 21,106.27 | 15,003.67 | 10,869.40 | 13,933.75 | 11,201.08 | 43.66 | 110,994.52 |

| | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------|
| Taxation of corporations: | | | | | | | | | | |
| Office | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 77,547.41 |
| Field | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 5,495.78 |
| Total | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 83,043.19 |
| Tobacco investigation: | | | | | | | | | | |
| Office | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8,888.27 |
| Field | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2,310.30 |
| Total | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 11,198.57 |
| Transpiration by water: | | | | | | | | | | |
| Office | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3,411.16 |
| Field | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 21.16 |
| Total | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3,432.32 |
| Trust legislation investigations: | | | | | | | | | | |
| Office | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 16,075.54 |
| Field | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 5,085.39 |
| Total | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 21,160.93 |
| Waterpower investigation: | | | | | | | | | | |
| Office | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4.24 |
| Field | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Total | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4.24 |
| Miscellaneous investigations: | | | | | | | | | | |
| Office | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,343.87 |
| Field | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,884.72 |
| Total | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3,228.59 |
| Grand total | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,921,452.84 |

NOTE.—Miscellaneous investigations include those on Cotton Tare, Cotton Pool, Employers' Liability and Workmen's Compensation, Patents, Interlocking Directorates, and Trade Agreements and Associations. They also include more or less preliminary work on several subjects on which the Bureau has made no comprehensive investigation, such as insurance, coal, and a few others, this being largely in the nature of office work.

REPORT
OF THE
DIRECTOR OF THE BUREAU OF STANDARDS

269

REPORT

OF THE

DIRECTOR, BUREAU OF STANDARDS

DEPARTMENT OF COMMERCE,
BUREAU OF STANDARDS,
Washington, July 1, 1914.

SIR: There is submitted herewith a report of the work of the Bureau of Standards for the fiscal year ended June 30, 1914.

I. FUNCTIONS, ORGANIZATION, AND LOCATION.

Since the Bureau of Standards deals almost entirely with scientific and technical problems, the following brief statement as to its functions and organization may be of assistance to those who are more or less unfamiliar with its work.

The standards with which the Bureau is authorized to deal may be conveniently classed as follows: First, standards of measurement; second, standard values of constants; third, standards of quality; and, fourth, standards of mechanical performance.

1. STANDARDS OF MEASUREMENT.

A standard of length may be taken as an example of a standard of measurement. It must be a length which is unchanging, reproducible, and capable of being compared with the working standards used in the most precise scientific work or with those used in commerce and industry. The fundamental standard must be subdivided and working standards prepared of these parts; for the measurement of greater lengths, standards must be prepared which are multiples of the fundamental standard. This process of subdividing and multiplying the standard involves even more difficulties than those met with in the preparation of the fundamental standard itself.

The construction of a set of standard weights from a single unit is also an illustration, but a whole set of standard weights must be prepared before the standard weight of the Government can become available to the public. When the standard of length or weight has been found with as many desirable qualities as possible, and before the working standards of the subdivisions or multiples can be prepared, the question as to the method of comparison arises which again involves the solution of difficult scientific problems in connection with the balance or the methods used. These balances range from that capable of measuring the thousandth part of a milligram to the large testing machine capable of measuring a load of thou-

sands of tons. The complete range must be covered, which involves not only a large number of working standards, all of which must agree with the fundamental standard, but apparatus suitable for the comparison of these standards with all of the lengths or weights found in practice.

These steps and equipment are absolutely essential in order to secure uniform measurements of length or weight throughout the country, and they have their counterpart in every quantity that has to be measured, whether it be length, weight, temperature, heat, light, or the various electrical measurements or other standards of measurement. These standards in one form or another are involved in practically every scientific investigation, industrial process, or engineering structure.

2. PHYSICAL CONSTANTS.

There are many fixed relations between physical quantities, the values of which it is extremely important to know. These values are usually termed "physical constants" and are used in every branch of scientific work or industry. The amount of heat required to change a pound of water into steam under normal conditions and the relation between heat and mechanical energy are two important physical constants; their values are used in practically every computation in connection with the designing of steam engines and boilers, the tests of their efficiencies or the measurement of their output. The amount of heat required to turn liquid ammonia into vapor or the amount of heat required to melt a pound of ice are constants equally important in the refrigerating industries. The value of the relation between electrical and mechanical energy is involved in many important commercial transactions concerned in electricity.

Accurate and authoritative values of these constants are just as essential as in the case of standards of measurement. Many of these now in use are old and obsolete and need redetermination by means of the best modern facilities for physical measurement. Their determination involves the most difficult and precise work in all branches of physics and chemistry—a fact not generally known by others than those engaged in the scientific and technical work where these constants are used.

3. STANDARDS OF QUALITY.

A standard of quality for a given material may sometimes take the form of a sample of that material with which other materials of the same kind can be compared, but this is generally a makeshift of the poorest sort. It is only resorted to in the absence of definite and reliable specifications in terms of measurable properties; that is to say, a standard of quality of a material usually takes the form of a specification or definition of its properties, involving, of course, the measurement of those properties by means of the usual standards of measurement. A certain kind of steel, a cement, a paint, an oil, or a paper or cloth, is found by use to be good or poor. The question then arises, Why is it good or poor; what are the physical or chemical properties or the particular combination of elements which make it of good or poor quality; how are its properties to be measured or its con-

stituents determined? These are questions for the laboratory to answer and involve physical and chemical investigations of the most difficult sort.

A standard of quality for a given material necessarily takes into account the purpose for which the material is to be used; to set the standard too low results in losses, poor efficiency, and even loss of life; to make it too high may result precisely in the same thing; that is to say, the material must be suitable for the purpose intended, and the Bureau's investigations in connection with the properties of materials are to enable the user of these materials, first, to select intelligently the material best suited for the purpose, second, to specify it in terms which the producer can not mistake, and third, to make the necessary tests to ascertain whether or not the material supplied is in accordance with the specifications.

The actual testing of materials by the Bureau of Standards to ascertain whether or not they comply with specifications is confined almost exclusively to Government purchases, but in making these tests (in which the Bureau has had the hearty cooperation of practically all the departments of the Government service) it is compelled to make many investigations concerning the properties of materials, their specification and measurement. While this work is of great value in placing Government purchases on a correct business basis, the results of the investigations as to the properties of materials and the information gained in testing Government supplies is even more important to the general public, and is distributed in the form of suitable publications.

The Bureau does not compete with private testing laboratories but endeavors to assist them by the development of standard specifications, methods of measurement, and other matters where uniformity is desirable, much of which information, as stated above, is secured in connection with the testing of materials purchased by the Government and a close observation of their use.

The time is not far distant when it will be required that all materials bought or sold shall be as represented, but it should be kept in mind that this is impossible except in the case of those materials where proper standards of quality and methods of measurement have been developed. It must not be assumed that the purchaser or user is the party principally benefited in the development of such standards; on the contrary, the manufacturer, first of all, is interested in the quality and all things which affect the quality of his product, and while the Bureau's efforts in this field are devoted principally to the pointing out and measurement of those properties upon which the quality of the materials depend, it is to be regretted that its force and equipment is insufficient to render more assistance to manufactures with a view to a direct improvement of those parts of the process upon which the quality of the output depends.

4. STANDARDS OF PERFORMANCE.

The value of an instrument, device, or machine almost always depends upon the efficiency of its performance. In such cases it is necessary to state the performance desired or guaranteed in terms which are correct and susceptible of measurement. As in the case of

standards of quality, the standard involved is more often in the form of a specification, but specifications are useless unless based upon correct scientific and mechanical principles and supplemented with a statement of the method to be used in ascertaining whether or not the specifications or guarantees have been complied with.

The performance of an engine or boiler, a pump, an electrical generator or motor, a weighing device, or a telescope, can usually be measured, but the quantities to be measured and the method used must be specified correctly and understood by all the parties concerned in the construction, purchase, or use of such apparatus. To do this properly involves the use of standards of measurement, standard values of constants, and standards of quality. The Bureau of Standards does not attempt to cover this field completely, but only those cases where there is a lack of definite information upon which to base specifications and only to the more important classes of apparatus. To secure this information involves investigations quite as scientific in character and as difficult as in the case of other standards, as well as a knowledge of technical and manufacturing processes.

The Bureau's activities in this field have only been developed to a slight extent and almost entirely in connection with Government purchases. It has had in this, as well as in the field of the properties of materials, the most hearty cooperation of the various Government experts, manufacturers, engineers, and technical societies.

Government purchases are not greatly different from those of the public. Whenever the Bureau makes a scientific investigation or secures information from other sources for the purpose of the improvement of specifications used in connection with Government purchases, whether for measuring instruments or for materials or equipment, such information or data is given to the public in the form of suitable publications. The value of this information from the standpoint of the public is even greater than that in connection with Government purchases, important as the latter is. In other words, the needs of the public and the Government service are precisely the same as far as standards or specifications are concerned, whether it be standards of measurement, quality, or performance.

In the case of the public, the Bureau confines its work to those investigations, experimental or otherwise, which enable it to give intelligent advice regarding the use, purchase, and testing of the more important apparatus and materials, leaving the testing to commercial laboratories; except, of course, in the case of standards of measurement, where it is absolutely essential that the standards of the public be compared with those of the Government to secure uniformity of measurement, and in unusual cases of testing where the public is not yet provided with suitable means or equipment. In the case of the Government, the Bureau goes further and serves as a testing Bureau for the various departments when called upon, and as such is assisting to place Government purchases upon an economical and businesslike basis. The example of the Government in such matters has a far greater influence upon the public than most people suppose. The Government can do no greater service to the country than to place its own purchases on a basis which may be taken as a standard by the public at large.

5. RELATION OF THE BUREAU'S WORK TO THE PUBLIC.

It is perfectly obvious, even to one unfamiliar with the subject, that the maintenance on the part of the Government of correct standards of measurement or quality or performance calls for continuous scientific and technical investigations of the highest grade, involving the most competent expert services and the best scientific equipment. When this is accomplished, there still remains the serious problem of making the results available and useful to the public.

The Bureau compares with its own standards of measurement the standards or measuring instruments of States, cities, scientific laboratories, educational institutions, manufacturers, Government bureaus, or the public, for which a nominal fee is charged, except in the case of the National and State Government institutions. It gives advice concerning these standards or their use, whether it be in connection with the enactment of laws, regulations, or ordinances concerning the weights and measures of everyday trade or in connection with precision standards used in scientific work and the industries. It gives advice upon request to State and city officials, public-service commissions, public-utility corporations, regarding the standards of measurement, of quality or performance, involved in legislation or regulation pertaining to the public utilities. Many questions of disagreement between the public and utility companies as to these matters are referred to the Bureau for advice or adjustment, often avoiding unfair or inconsistent regulations, as well as long-drawn-out and expensive litigation. There is a great need on the part of the public for unbiased and reliable information pertaining to the standards entering into the regulation and sale of the services of public utilities. As far as possible such information is given in the form of publications upon definite subjects.

It must not be inferred from the above that the Bureau's activities are devoted principally to the interests of the user or consumer. The fundamental facts regarding standards of measurement, quality, or performance are the very things which most deeply concern manufacturers; they are fundamentally concerned, either directly or indirectly, with the improvement of methods of production or the quality of the output. It may be said that the Bureau occupies somewhat the same position with respect to the manufacturing interests of this country that the bureaus of the Agricultural Department do to the agricultural interests. Many industries are just beginning to realize the importance of precise methods of measurement and scientific investigation, which, in practically every case, involve some kind of measurement.

It is upon quality as well as upon price that competition must finally depend, whether in domestic or foreign commerce. The use of exact methods and scientific results is the greatest factor in the improvement of quality, efficiency, or the development of new industries. The educational value of the Bureau's work in this respect is almost entirely unknown to the general public, and yet the Bureau receives hundreds of letters, as well as many personal visits from manufacturers, seeking information as to standards of measurement, how to use them, how to measure the properties of materials, or as

to the fundamental physical and chemical principles involved; also, what is of even greater importance, how to initiate and carry out scientific investigations and tests on their own account in their particular fields of work.

The importance of maintaining scientific institutions having to do with standardization and the application of precise measurements to the industries has been recognized by all the leading countries of the world. Great Britain maintains the Standards Department of the Board of Trade, which is in charge of the standards and inspection service of the trade weights and measures; also the National Physical Laboratory, whose functions include matters pertaining to scientific and technical standards, physical constants, and to some extent the properties of materials. The Laboratoire d'Essais, of France, while not as extensive as the English institution, is charged with similar duties. Germany maintains three such institutions—the Normal-Eichungs Kommission, equipped with the buildings, personnel, and apparatus necessary in standardizing and controlling the weights and measures of trade; the Physikalisch-Technische Reichsanstalt, covering testing and investigations in connection with scientific and technical standards other than weights and measures; and the Prussian Government maintains the Materialprüfungsamt, a large institution devoted to the investigating and testing of structural, engineering, and other materials.

It is generally recognized that these institutions have been exceedingly important factors in the industrial progress of these countries.

6. ORGANIZATION.

The organization of the Bureau's scientific and technical staff is based upon the nature of the expert service involved rather than upon the classes of standards. For example, the division of weights and measures has to do with all matters pertaining to standards of length, mass (weight, as it is commonly termed), time, density, and similar questions, whether they arise in connection with the precision standards used in scientific investigation, the master standards of manufacturers, or the ordinary weights and measures of trade. A standard of quality or performance where any of the above measurements form the fundamental and most important factor would be referred to this division.

The division of heat and thermometry has to do with heat standards, the testing of heat-measuring apparatus, the determination of heat constants, of which there are many, and all investigations pertaining to quality or performance where heat measurement is the essential and predominating factor.

Similarly, the electrical division is concerned with all the electrical problems that may be taken up at the Bureau, whether in connection with the various electrical standards of measurement, electrical constants, the electrical properties of materials, or the performance of electrical equipment.

Questions in optics enter into standards of all kinds to a greater extent than has been supposed; hence, there is an optical division provided, with experts in spectroscopy, polarimetry (used in sugar analysis), color measurement, the principles of optical instruments, and the measurement of the optical properties of materials.

Practically all investigations concerning the various classes of standards involve chemistry in one form or another. There are also many chemical standards and questions which arise in connection with chemical work generally, especially in the industries; hence, there is a chemical division, cooperating with every other division of the Bureau, as well as taking care of the questions of a purely chemical nature that come to the Bureau and which fall within its functions.

In the case of the more important technical fields, divisions have been formed dealing more specifically with large and important classes of materials, but many of the purely scientific questions involved would be handled by one of the above scientific divisions or jointly with it. The work of the technical divisions is just as scientific in character, but deals more specifically with manufactured products.

The work of the structural engineering and miscellaneous materials division includes the investigation, testing, and preparation of specifications for the above materials, such as the metals and their alloys, stone, cement, concrete, lime, the clay products, paints, oils, paper, textiles, rubber, and other miscellaneous materials.

The division of engineering research makes investigations and tests regarding the performance and efficiency of such instruments, devices, or machinery, as the Bureau may take up that do not fall directly under one of the scientific divisions. The division is a small one and its work is devoted almost exclusively to assistance given other departments of the Government and the General Supply Committee in designing, specifying, or testing equipment. It should in time form one of the most important branches of the Bureau's work.

The questions pertaining to the manufacture, specifications, testing, and use of the metals and their alloys have become so important that a division known as the metallurgical division has been formed of the experts engaged in these problems.

The employees engaged in clerical work, purchasing, files, records, accounting, and library, are known as the office division, while those employed in the operation of the mechanical plant, the various shops, and the care of the buildings and grounds, form the engineering and construction division.

7. LOCATION.

The laboratories of the Bureau of Standards are located in the northwest section of Washington, on Pierce Mill Road, near Connecticut Avenue, and are reached by the Chevy Chase car line. It was located outside of the business center of Washington in order to insure freedom from mechanical, electrical, and other disturbances common to the business and more thickly populated sections of the city. Furthermore, the area of ground necessary precluded a site near the city. It has been found by experience that the efficiency of the employees, especially those engaged in testing and scientific investigation, has been greatly increased by the location of the laboratories in a section free from the ordinary disturbances of city life.

II. SCIENTIFIC AND TECHNICAL DIVISIONS.

1. WEIGHTS AND MEASURES.

Weights.

During the year 16 States have had standard weights tested. In some cases the weights submitted for test were new and of modern manufacture and design, and in others they were very old and were either tested for temporary use or discarded. The number of States submitting standards for test and the character of the standards indicate the increased interest that is being taken by the public in weights and measures work. The Bureau has tested for the Post Office Department 80 sets of test weights, which are to be shipped from place to place by that department for use in verifying scales in use in its dealings with the public. The necessity and the desirability of the Government maintaining accurate scales of highest standard in its transactions with the public has been pointed out on various occasions by this Bureau.

Cast-iron weights, under investigation for several years, have shown conclusively that such weights must be checked at least once a year to insure their accuracy, even when not in use.

Improvement in the design of what are commonly called test weights has received a great deal of attention by this Bureau, and manufacturers, following the suggestions of the Bureau, are now producing reliable weights of this kind. Further efforts are being directed toward reducing the cost of these weights, since large numbers of them are used by local sealers of weights and measures.

Improved facilities for work of the highest precision were secured at the close of the year by the construction of a double walled constant temperature room, which is divided into separate compartments for the balances and the operator. The work of fitting up this room will be carried on as rapidly as the routine work will permit.

Capacity Measures.

The number of capacity measures tested during the past year amounts to 295, as compared with 66 the previous year, there being a large increase in the number submitted by the United States Government and State institutions, as well as by private parties. There has also been a large increase in the number of cubic-foot bottles or fractional cubic-foot bottles submitted for test for use as standards in the testing of gas meters.

With the enlargement of the division's quarters, made possible by the removal of the electrical division to the new east laboratory, more space has been allotted to the work of testing capacity measures, resulting in the work being handled much more satisfactorily.

There was a considerable decrease in the number of length measures submitted for test, due to a great extent to a less number being presented by the Government. A 100-foot bench standard, located in the City Hall, Chicago, was graduated and standardized for the Western Society of Engineers.

The Bureau has cooperated with the manufacturers' standardization committee with a view to securing greater uniformity in the use of the American Briggs pipe thread standards, and it is expected

that a set of standards on this system will be deposited with the Bureau.

Inspection of Scales.

One man has been detailed at Chicago during the entire year to inspect scales being manufactured for the Post Office Department. Two thousand one hundred and thirty-two scales have also been tested for the Post Office Department at a factory in Vermont. The advisability of having scales purchased by the Government thoroughly inspected and tested before being accepted, and of having this work done at the factory, as recommended by the Bureau on previous occasions, has been fully demonstrated by the scale inspections at the factory.

In addition, the Bureau has received many requests from the Navy Department and other departments to test scales, but all of these requests could not be complied with on account of lack of sufficient force and equipment. The same was true in several instances where tests were desired by corporations or individuals in States where such work has not yet been taken up by State or local authorities. In some of these latter instances it was clear from the correspondence that the results obtained from the use of the scales in question were of vital importance to the communities or individuals concerned.

Cement Sieve Testing.

The methods of testing the sieves used in the testing of cement has been well systematized so that this is now quite a routine matter. As a result there has been a great improvement in the quality of the sieves submitted for test and the percentage of rejections has been greatly reduced.

Time.

Early in the year a room for the testing of watches was prepared, and was equipped with heating and cooling apparatus, fans for the circulation of the air, thermostat and automatic switch for controlling the temperature. Proposed regulations for the testing of watches were drawn up and submitted to the various jeweler's journals and to manufacturers of watches, together with a statement of the preliminary tests that had been made at the Bureau, and its plans for the future testing of watches for criticism. A conference of watch manufacturers was held at this Bureau in February, at which these regulations were discussed. Practically no change in the regulations was made by this conference, and the regulations were put into effect by the Bureau. The first watch test was made in April, and the Bureau is now prepared to hold these tests regularly four times a year. It is confined to the higher grades of watches only, for which a fee is charged.

Gas-Meter Testing.

The investigation of various methods and devices for measuring gas during the past year has been developed with considerable satisfaction. The use of oil instead of water in cubic-foot bottles has been under trial for several months and promises to be an improvement over the usual method. A method of testing laboratory gas

meters has been devised which has a number of advantages over that now in use. An investigation of the factors affecting the accuracy of laboratory wet-gas meters is in progress. An improvement in meter provers to minimize errors in testing dry-gas meters, and other apparatus, is being developed. An extensive investigation of the closeness with which the discharge of acetylene burners of various manufacture occur was made and some valuable and interesting results were obtained. During the year a few laboratory gas meters for laboratories outside of the Bureau were tested, and also a number of meters of the same type for various kinds of Bureau work involving the measurement of gas.

Volumetric Glassware.

The routine testing of volumetric apparatus to be used as standards and for precision work in chemical laboratories and by the Government included flasks, cylindrical graduates, burettes, and pipettes. During the year this testing comprised 3,344 pieces of apparatus; and 1,213 hydrometers, principally for the Internal-Revenue Service in connection with the collection of revenue on distilled spirits, were examined. In addition to these tests 109 density determinations have been made. Aside from the routine work just mentioned, a large amount of research has been carried on by the volumetric section with a view to the improvement of the design, testing, and use of volumetric standards.

An investigation of the density and thermal expansion of milk and cream has been made for the dairy division of the Department of Agriculture, and a similar investigation of linseed oil and turpentine was completed for the American Society for Testing Materials. This last work was a continuation of and supplementary to the work done for the society three years ago. During the year work on the expansion of petroleum oils has been continued and a very considerable amount of data is now available. It is expected that during the coming year the work will be completed and tables prepared for the use of oil inspectors and others who may have occasion to use information on the rate of change of density and volume of oil with change of temperature.

Expansion of Materials.

An investigation of the expansion of a bronze bar due to changes in temperature has been carried on for some months. This property of the bronze bar in question was first investigated in an oil bath in temperatures ranging from 20 to 150° C.; subsequently an electrical furnace was employed between the temperatures of 17 and 630° C.; and later a third series of observations between 14 and 300° C. were made with a new dilatometer and oil bath. The results of these investigations showed, first, the precision of the method with three different pieces of apparatus; second, the regularity with which the bronze assumed a definite length at a definite temperature; third, indications of structural rearrangements too small to be detected by the ordinary cooling-curve method of thermal analysis; and fourth, the possibility of maintaining the material while being heated (under certain conditions) in an unstable state and in which it expands much less than ordinarily.

The thermal expansion of samples of glass, porcelain, and brass have also been investigated.

An investigation has been commenced to determine whether any relation exists between the thermal expansions of a metal and the simultaneous changes in its electrical resistance. This was undertaken partly for the purpose of determining, if possible, a method of checking one class of measurements by means of the other, and partly to accumulate data that might have other practical as well as theoretical application. The results already obtained show that, in at least some cases, readjustments of internal structures that are accompanied by minute increments of length are also accompanied by corresponding increments of electrical resistance.

Barometry.

Investigations of mercurial and aneroid barometers have been carried on during the year and problems of practical application have been studied and experimented upon. A standard method has been adopted for the testing and certification of high-grade aneroids. This test emphasizes the discrepancies between the results obtained with pressure changing rapidly, as compared with slow changes; also that the instrument should be free from various mechanical errors frequently met, and that it should include a simple temperature test. Besides the standard method, a short method of testing has been adopted for low-grade aneroids and a definite method is about to be adopted for testing short-range aneroids used in navigation and in the household.

During the year two representative aneroids taken abroad in the summer of 1913 were tested at the national standardizing laboratories of Germany, England, and France. The reports have been analyzed and the data are most interesting and leave no doubt as to the superiority of our own method.

In the past year an improved method of setting a mercury surface to a required height has been devised, by means of which the accuracy of certain types of barometers and other pressure gauges involving the use of mercury, may be increased.

Track Scale Testing Equipment.

The railroad track scale testing equipment of the Bureau, secured under an appropriation of \$25,000, available July 1, 1913, was completed and ready for service in September. During the year tests were made on 38 railroad scales in Connecticut, Vermont, New York, and New Jersey. The tests made in the two latter States were for the Customs Service in the vicinity of the Port of New York.

Aside from the value of these tests as indicating the accuracy of the scales examined, they yielded much data which will be of value in determining the best methods of testing such scales and improving the design, with a view to obtaining greater accuracy and reliability.

Allowing a tolerance of 0.2 of 1 per cent, which, in the opinion of the Bureau, is a fair tolerance for such scales, 80 per cent of the 16 scales tested in Vermont would have been rejected; on a tolerance of 0.4 of 1 per cent 60 per cent would have been rejected; and on a tolerance of 1 per cent 40 per cent would have been rejected. The magnitude of some of the errors was as follows: 1,349 pounds with a

load of 35,000; and 1,149, 1,129, and 2,459 pounds on three scales with loads of 70,000 pounds. Of the 16 scales tested at the Port of New York, 75 per cent would have been rejected on a tolerance of 0.2 of 1 per cent, 56 per cent on a tolerance of 0.4 of 1 per cent, and 25 per cent on a tolerance of 1 per cent.

The above results clearly show the necessity for periodic inspection of such scales and indicate to some extent the great losses which may be sustained by the use of uninspected track scales. As previously pointed out, the inspection of railroad track and elevator scales should be taken up by or under the supervision of the Federal Government, rather than by the States, for the reason that practically all shipments weighed upon them are interstate.

Requests for services of the car have been received from State and city officials and others in a number of States, among which may be mentioned Ohio, Indiana, Illinois, Missouri, Iowa, Minnesota, Wisconsin, and Tennessee, and, no doubt, many other requests will be filed from time to time. It is obvious that one, or even two, cars could not comply with all these requests within a reasonable time, to say nothing of many other scales in every State in the Union which should be inspected. While another car will be procured under the appropriation of \$40,000, available July 1, 1914, it is evident that additional cars will be required in the future for this work.

It is respectfully recommended that Congress be urgently asked to increase the sum available for the investigation and testing of railroad track scales, elevator scales, and scales purchased by or belonging to the Federal Government, and also to provide facilities for cooperating with States in their endeavor to bring about uniformity in weights and measures.

With the \$40,000 made available July 1, 1914, an additional test car of 75 tons capacity will be provided and also a master scale on which the 10,000-pound weights used in this work may be compared. These two items with the additional help needed in this work and the expense of keeping two cars in the field will consume the amount provided. The numerous demands for the car now available clearly demonstrate that if the Bureau is in any way to adequately occupy this field it should have additional cars with the necessary equipment and crews to operate them.

Assistance to Porto Rico.

At the request of the Bureau of Insular Affairs this Bureau detailed one of its experts, to organize an inspection department of weights and measures for the island of Porto Rico, under an act of August 18, 1913, requiring the inspection of all commercial weights and measures in use under the supervision of the Secretary of Porto Rico.

It devolved upon the Bureau's representative to devise a system of keeping records suitable for the service, to advise what kind and quality of apparatus should be obtained for primary standards and for the use of the inspectors. Keeping in view the amount of the appropriation available, the needs of the service, and the climatic conditions; to make rules and regulations for the enforcement and clearer understanding of the law, as provided by section 10 of the act; to write explicit instructions and devise tolerances and specifica-

tions for the guidance of the inspectors; and, finally, to instruct them in the duties of their office.

Thus, there was established at the beginning a complete record system, and an organized force of inspectors, equipped with suitable apparatus and provided with specifications and tolerances for the inspection or rejection of apparatus, the entire organization and its management being based on years of experience, and having at the outset a degree of perfection such as has not been obtained by States of the Union after years of experience.

Too much emphasis can not be laid upon the importance of properly establishing an inspection department at the outset and avoiding methods of inspection and administration which are at once inimical to the best interests of the consumer and detrimental to the merchants. By properly establishing a weights and measures department at the beginning, results favorable to the consumer, as well as to the honest merchant, immediately accrue, and all prejudice against weights and measures inspection is thus forestalled.

In this connection attention is called to the fact that opportunities for rendering similar services to States in the Union are continually arising, and it is to be regretted that the funds, as well as the force, available for such work, are entirely inadequate to meet the needs.

Weights and Measures Conference.

The Ninth Annual Conference on Weights and Measures was held at the Bureau of Standards in May of this year, and was more largely attended than any previous meeting, there being representatives from 26 States and the District of Columbia and 67 cities and counties; in all, 116 officials. There was also present a large number of manufacturers and other persons interested in the subject of weights and measures. In addition to an excellent program, an interesting and instructive feature of the meeting was the exhibit by manufacturers of various types of weighing and measuring apparatus.

The wisdom of these conferences being fostered by the Bureau is demonstrated each year by the fact that increased interest is taken in them because of their association with a Federal bureau; by the cooperative work accomplished tending toward uniformity in the weights and measures legislation passed by the various States; and in the tolerances and specifications for commercial apparatus adopted by a number of the States. These conferences not only bring the State and city officials in contact with the Bureau, but are of great assistance to officials from States and communities newly organizing weights and measures service.

Legislation.

An act of Congress, important in the field of weights and measures and one which has received a great deal of attention by this division, was approved March 3, 1913, making amendment to the food and drugs act of June 30, 1906, which requires that the net weight, measure, or numerical count shall be plainly and conspicuously marked on the outside of all packages containing food. Legislation of this character has been long sought by friends of honest weights and measures, and success has finally been attained largely through fear on the part of the opposition that the action of a few

States in passing legislation of this kind would be followed by many other States, and thus manufacturers of products for interstate shipment would be obliged to comply with many laws having different requirements and conflicting provisions.

In connection with this amendment the chief of the weights and measures division of the Bureau represented the Secretary of Commerce on a committee of three, representing the Secretaries of Commerce, the Treasury, and Agriculture, appointed to draft rules and regulations for the enforcement of this amendment.

Two weights and measures bills of importance are now pending before Congress—one "to fix a standard barrel for fruit, vegetables, and other dry commodities," and the other "to regulate and control the manufacture, sale, and use of weights and measures." This latter bill provides that the Bureau of Standards shall have the authority to approve and shall approve the various types of weighing and measuring devices which may lawfully be used in trade and commerce throughout the United States. The principles involved in each of these bills have the hearty indorsement of the Bureau, and it is hoped that the pending legislation will soon be enacted.

The division has also been keeping informed as to weights and measures legislation passed by the States, obtaining carefully verified copies, so that the Bureau's publication of State and national laws "Concerning the Weights and Measures of the United States" may be revised promptly when deemed advisable, and in order that correspondence may be more expeditiously and satisfactorily answered than would be possible without having such legislation at hand.

Publications.

During the year there have been issued "The report of the eighth annual conference on weights and measures"; Circular No. 43, "The metric carat"; Circular No. 46, "The testing of barometers"; Scientific Paper No. 214, "Note on the setting of a mercury surface to a required height," and Scientific Paper No. 219, "Production of temperature uniformity in an electric furnace." The following proposed publications have been partially prepared: A circular on "The testing of screws and screw threads"; Circular No. 47, "Units of weight and measure; definitions and tables of equivalents," (in press); "Report of the ninth annual conference on weights and measures"; "Measurement of time and testing of time pieces"; "Instructions for the guidance of weights and measures officials"; "Tolerances and specifications for commercial apparatus"; revision of Circular No. 3, "Verification of standards of mass"; and a circular on "Wagon scales."

2. THERMOMETRY, PYROMETRY, AND HEAT MEASUREMENTS.

Calorimetric Resistance Thermometers.

Details of construction and the method of use of special resistance thermometers have been developed by the Bureau for calorimetric measurements requiring the highest attainable accuracy. (See Scientific Paper No. 200.) The construction of these thermometers for the public has been undertaken by a well-known American instrument manufacturer and they have already found extensive applica-

tion in technical and university laboratories. The accuracy attainable with these thermometers is about ten times that previously attainable with the best mercurial thermometers.

Melting Points of the Refractory Elements.

A joint investigation was undertaken with the metallurgical division, for the purpose of determining the melting points of elements of the iron group—nickel, cobalt, iron, manganese, chromium—and of vanadium and titanium by means of the micropyrometer, an instrument developed in the laboratories of the Bureau for determining melting points of minute samples of materials. The melting points observed and the degree of purity of the elements used are stated in full in Scientific Paper No. 205 and lead to the conclusion that the probable melting point of the pure elements are as follows:

| | | | | |
|---------|----------|------|---------|-----------------|
| Ni..... | 1452° C. | ± 3 | Cr..... | 1520° C. to Fe? |
| Co..... | 1478° | ± 5 | Va..... | 1720° ± 30 |
| Fe..... | 1530° | ± 5 | Ti..... | 1795° ± 15 |
| Mn..... | 1260° | ± 20 | | |

The paper supplies important chemical and metallurgical data on some of which the existing data was quite conflicting.

Melting Points of Some Refractory Oxides.

A previous publication of the Bureau gave the results of determinations of the melting points of 62 samples of fire brick and of materials of importance in the manufacture of fire brick. Further determinations of the melting points of some highly refractory oxides have been carried out in an electric furnace which could be evacuated or supplied with a current of inert gas. The temperature measurements were made with an optical pyrometer. The melting points found were:

| | | | |
|--------------------------------------|----------|----------|----------|
| Cr ₂ O ₃ | 1900° C. | CaO..... | 2572° C. |
| Al ₂ O ₃ | 2050° | MgO..... | 2800° |

The data are of importance to the ceramic industries and in many high temperature problems, such as the design of furnaces, etc., besides having a general physical-chemical interest. (See Scientific Paper No. 212.)

The Monochromatic and Total Emissivity of Nickel Oxide (NiO) in the Range 600° to 1,300° C.

An investigation has been under way for some time to determine the radiating properties of metals and oxides at high temperatures. In many industrial operations the only available method of measuring the temperatures is by means of optical pyrometers which measure the intensity of the light, or by radiation pyrometers which measure the intensity of the heat (and light) radiations emitted by the hot body, the temperature of which is to be measured. As the radiating properties are different for every material, it becomes necessary to determine these properties to enable the technical man to correct his observed pyrometer readings to the true temperature of the material under observation. These corrections are in some cases very considerable, amounting to several hundred degrees centigrade or more for some of the metals in their molten condition.

In a previous paper (Scientific Paper No. 121), the Bureau published data for correcting the observed readings of optical and radiation pyrometers when used to measure the temperature of red-hot copper, in the solid and in the molten state, when the surfaces were clean and when oxidized. In the present paper similar data are given for nickel oxide surfaces in the range 600° to $1,300^{\circ}$ C.

The Specific Heat of Copper.

Copper enters into the construction of calorimeters and its specific heat and the variation of its specific heat with temperature must be known with an accuracy higher than could be obtained from existing data. It was therefore necessary for the Bureau to undertake its redetermination in the ordinary range of temperature of calorimetric work to an order of accuracy demanded by several important calorimetric investigations now well under way in the laboratories of the Bureau.

The copper was annealed wire, 99.87 per cent pure, according to chemical analyses. The results of 27 determinations at temperatures between 15° and 50° C. show an average deviation of 1 part in 1,000 from $0.3834 + 0.00020 (t^{\circ} - 25^{\circ})$ international joules per gram degree or $0.0917 + 0.000048 (t^{\circ} - 25^{\circ})$ calories (20°) per gram degree if 4,182 joules be taken as equal to 1 (20°) calorie.

Latent Heat of Fusion of Ice.

The latent heat of ice, or conversely the amount of heat that must be removed from unit mass of water at 32° F. to freeze it to ice at that temperature, is one of the fundamental constants of refrigeration engineering. Previous determinations of this constant are not in good agreement. Engineers in their computations use values ranging from 142 to 144 British thermal units per pound. The Bureau having been asked by refrigeration engineers, through their technical societies, to standardize practice, a new and careful determination of this constant was undertaken by the Bureau. Two independent methods of experimentation were used, which gave results in agreement to about 1 part in 2,000. The result found for the latent heat of ice was, 79.63 calorites (15° C.) per gram mass, 143.33 B. t. u. per pound mass, or 143.5 B. t. u. per pound weighed in air against brass or iron weights.

The results of this investigation were communicated to the Third International Congress on Refrigeration, held at Chicago in September, 1913. (See Scientific Paper No. 209.)

Industrial Gas Calorimetry.

Legal requirements are tending toward the specification of the heating value for gas. An investigation was accordingly undertaken at the request of American gas engineers to furnish information to engineers, inspectors, and public-service commissions as to the sources of error, important precautions in the use of, and accuracy attainable with the various calorimeters widely used in the gas industries.

An exhaustive investigation was made of nine different makes of calorimeter that have found extensive use in the gas industries for the measurement of the heating value of gas. An analytical investigation was made of the various heat losses from the calorimeters;

of modifications in the method of operation to reduce these heat losses; and of the effect of operating the calorimeters at different rates of gas consumption, air supply, etc., and under different conditions of atmospheric humidity; and sources of error in metering the gas. The several gas calorimeters were intercompared and one of them was compared with two calorimeters of the bomb type, using different gases (hydrogen, illuminating gas, and natural gas). (See Technologic Paper No. 36.)

Standard Methods of Gas Testing.

In order to make available to gas engineers and inspectors the results of the exhaustive investigation of gas calorimetry, briefly outlined above, the Bureau has published (see Circular No. 48) specific directions for operating gas calorimeters that will enable the user to obtain accurate and reliable results. It is hoped that this publication will place before American gas engineers detailed directions for an approved and authoritative method of gas testing, thus filling the place in American gas-testing practice that has been filled in English practice by the Notifications of the Gas Referees.

Combustion Calorimetry and the Heats of Combustion of Cane Sugar, Benzoic Acid, and Naphthalene.

The Bureau has designed a special calorimeter for the determinations of the heats of combustion with the highest attainable accuracy, and has measured the heats of combustion of cane sugar, benzoic acid, and naphthalene, the three substances that are now regularly sent out by the Bureau as standard combustion samples and widely used by chemists and engineers for the standardization of the calorimeters used for testing the heating values of fuels, foods, etc. The widespread and growing demand for these standard samples emphasizes the importance of this investigation.

The use of these samples enables the user of a calorimeter to quickly check the accuracy of his work, and has practically reduced the work of all calorimetric laboratories to a uniform and comparable basis. Before such checks on the accuracy of the work were possible, cases had been called to the attention of the Bureau where tests on the same samples of fuels in the laboratories of the purchaser and the seller differed by amounts sufficient to affect the basis of settlement by thousands of dollars annually, as the fuels were purchased on the basis of their heating value. The heating values found were as follows:

Cane sugar = $3,949 \pm 2$ calories (20°) per gram

Benzoic acid = $6,329 \pm 1$ calorie (20°) per gram

Naphthalene = $9,622 \pm 1$ calorie (20°) per gram

where the substances are weighed in air against brass weights.

Cold-Junction Correction for Thermocouples.

Cases have come to the attention of the Bureau where errors in these temperature-measuring instruments as great as 50° C. were possible, owing to erroneous application of the correction for the cold-junction temperature. Scientific Paper No. 202 was written with the aim of impressing upon the technical man the necessity of using some caution in the matter of the cold-junction temperature of thermocouples. This paper gives the details of the methods of applying the

proper corrections and discusses briefly devices for the elimination of the cold-junction corrections.

Ocean Temperatures in the Vicinity of Icebergs and in Other Parts of the Ocean.

The unfortunate accident to the *Titanic* centered attention on possible methods of detecting the proximity of icebergs. Great differences of opinion seemed to exist as to the value of sea-water temperatures for this purpose. The usual method of roughly taking the temperature of a pail of sea water at widely separated intervals of time could give no useful information so far as detecting the proximity of icebergs is concerned. If any definite variations in the sea-water temperature are caused by the proximity of icebergs, then continuous records of the temperature should be taken.

The Bureau having in use in its laboratories instruments for obtaining continuous temperature records, it was deemed of sufficient importance to test the value of such records for the purposes of detecting the near approach to icebergs. The necessary equipment was hurriedly constructed and assembled and, through the courtesy of the Navy Department, installed and operated by representatives of the Bureau on the U. S. S. *Chester* and the U. S. S. *Birmingham*, in the summer of 1912. A specially constructed electric resistance thermometer, together with a Leeds and Northrup recorder, was used to obtain continuous records of the sea-water temperature. This equipment was sensitive to a few hundredths of a degree. Numerous records of sea-water temperatures were taken while approaching and cruising around icebergs and in other parts of the ocean. (See Scientific Paper No. 210.)

The general conclusions reached were that the temperature variations in parts of the ocean far removed from ice are often as great and as sudden as in the immediate neighborhood of icebergs, and that it is not possible to draw positive conclusions as to the absence or proximity of ice from the temperature records of sea water. The temperature records may, however, give valuable information and warning of approach to shore and shallow water, on the location and identification of characteristic ocean currents, and even of the proximity of ice in some parts of the ocean, distant from comingling ocean currents, where the temperature variations are less sudden and erratic than in the regions where the above observations were made.

An attempt was also made to detect, by means of the ships submarine telephones, the submarine echoes, from the submerged portion of a large iceberg, of the sound waves sent out by striking the ship's bell lowered under water. For lack of time and facilities these experiments could not be followed out, but as far as they went seemed sufficiently promising to merit further trial.

The Bureau has had a scientific observer aboard the U. S. revenue cutter *Seneca* in its patrol of the North Atlantic Ocean with a complete equipment for obtaining the necessary physical and meteorological data. This work has been planned by, and is being carried out in cooperation with the Revenue-Cutter Service, the United States Weather Bureau, the Hydrographic Office, and this Bureau. The biological work is being carried out by the Bureau of Fisheries.

Refrigeration Constants.

This very extensive investigation, undertaken at the request of American refrigeration engineers expressed through their national associations, includes the determination of the fundamental constants of refrigeration engineering. The results of the determinations of the first of these constants, viz, the latent heat of ice, have already been briefly reviewed above. Other fundamental constants on which work is now progressing are:

- (a) The specific heat of ice.
- (b) The coefficient of thermal expansion of ice.
- (c) The specific and the latent heats of the liquids used in refrigeration, such as ammonia, aqueous ammonia solutions, carbon dioxide, methyl chloride, etc.
- (d) The specific heats of the vapors of the liquids used in refrigeration.
- (e) The specific heats of brines.
- (f) The specific volumes of saturated vapors of the liquids used in refrigeration.
- (g) The densities of aqueous ammonia solutions.
- (h) The pressure-temperature relations of the liquids used in refrigeration.
- (i) The thermal conductivities of insulating materials used in cold storage construction, in steel passenger and mail cars, in furnace construction, etc.

Nearly all of the apparatus required for these investigations has been designed and most of it has been constructed in the instrument shops of the Bureau, and the more important pieces of apparatus have been tried out in the laboratory with most satisfactory results. This investigation has involved first of all the original design and construction of a vast amount of accurate and complicated apparatus and the overcoming of what at times seemed most discouraging experimental difficulties. Now that much of this work has been accomplished, it is believed that experimental results will follow as quickly as can reasonably be expected.

The descriptions of the numerous pieces of apparatus, such as low temperature thermostats, calorimeters, mercury manometers, piston pressure gauges, etc., and of the experimental methods that have been adopted can hardly be comprised within the space of a report of this kind. It is believed that most of this schedule can be completed in the course of the next two years, with the completion of which, it is confidently believed, the fundamental constants of refrigeration will rest on a most satisfactory basis for many years to come.

This work is being carried out with the cooperation of committees of the American Association of Refrigeration, and the American Society of Refrigerating Engineers, the members of which visit the Bureau annually and keep in close touch with the work, and have rendered valuable assistance by practical suggestions.

Heats of Combustion Gases.

American gas engineers have requested the Bureau to issue an authoritative table of the heats of combustion of the more important gases entering into the composition of manufactured gas. In view of the fact that existing data are discordant and are based on methods that are much inferior to those now available, further work is necessary before such a table can be issued with that degree of confidence which would assure its universal adoption. Most of the necessary apparatus required for this work has been developed and is now at hand and some of the experimental methods to be used have been

tried out in the laboratory. This investigation requires a great amount of chemical work in the production of the various gases in the highest state of purity, and the determination of their heats of combustion in calorimeters of special design capable of yielding results of the highest attainable accuracy.

Resistance Thermometry.

In connection with the calorimetric platinum resistance thermometers that have been developed by the Bureau for measuring small temperature changes of a few degrees with an accuracy of a few ten-thousandths of a degree, it has been necessary to design and construct several special resistance bridges, the details of construction of which will be described in a forthcoming paper.

Heat Capacity of Water and the Mechanical Equivalent of Heat.

This investigation is of fundamental importance in fixing the primary unit of heat. In the half dozen or more extended pieces of work that have been published on this subject, which may be said to be more or less generally accepted, there appear startling discrepancies, and it is evident that this fundamental measurement has not been made with anything like the degree of accuracy which modern calorimetric practice demands. In the course of the calorimetric researches that have been under way in the laboratories of the Bureau during the past several years, a great deal of valuable data have been obtained on the capacity for heat of water. The work has suggested improvements in apparatus and in methods of experimentation which will be tried out as soon as opportunity permits. In view of the importance of the work and of the discrepancies in existing data, it is deemed best to withhold publication until the work has been carried out with the highest accuracy that can be obtained by the best modern methods.

Radiation Pyrometers.

One method of measuring the temperature of heated objects, which is particularly applicable to certain technical operations, and which is coming into extended use, consists in the use of a radiation pyrometer, which measures the intensity of the total radiation (i. e., both the light and the longer heat waves) emitted by the heated body. In the work of testing these instruments the fact developed that their indications varied with the size of and with the distance from the heated body, with the time of exposure, with the focusing, etc. Accordingly, an investigation was undertaken of a number of such instruments which had been submitted to the Bureau for test. This work, which is nearly completed, will treat in necessary detail the various forms of radiation pyrometer, their calibration, sources of error, and applications in technical industries. It is hoped that the data which will be submitted will result in a marked improvement in construction, and greater satisfaction in the use of this important type of temperature measuring apparatus.

Radiating Properties of Metals and Oxides.

This data is required to enable technical men to correct the observed indications of optical pyrometers. As stated in a previous section of this report, two investigations along these lines, on copper and

on nickel oxide, have been completed. The radiation from other substances of industrial importance will be examined from time to time as opportunity permits.

Behavior of Base-Metal Thermocouples at High Temperatures.

In view of the extensive use of these couples in the measurement of temperature, it is of importance to determine the changes in their readings due to long-continued exposure to high temperatures. A number of such couples are now under test to obtain such data.

The Thermal Conductivity of Refractories at High Temperatures.

Little reliable data are available on the heat conductivity of building materials. Their conductivity has an important bearing in the use of such materials, upon their behavior under fire conditions, their use in conserving heat, in furnace construction, etc.

The first materials selected were graphite and amorphous carbon, not alone on account of their importance in modern electric furnace construction, but also to test out several new methods of determining thermal conductivities at high temperatures, a constant extremely difficult of determination. The preliminary experiments made thus far promise success.

Industrial Viscosimetry.

The Bureau is constantly receiving requests from technical men for information on the measurement of the viscosity of lubricating oils, one of the important constants that determines the lubricating properties of an oil. More than a score of long letters and reports are prepared annually in reply to such requests. The Bureau accordingly started several years ago to make an intercomparison between the Saybolt-Univrsal, the Engler, and the Redwood viscosimeters, the instruments most widely used in this country and abroad, with a view to preparing conversion tables that would enable technical men to convert their results from the scale of any one to the scale of either of the other two. More assistance should be available for the work. Preliminary conversion tables for the first two of the aforementioned instruments have been furnished to a number of technical men in the reports above referred to.

Low-Temperature Laboratory.

Considerable time of the working force of this laboratory has been devoted to installation and operation of the carbon dioxide refrigeration plant which is in daily use in connection with the problems described under "Refrigeration constants," to the production of liquid air, when required for low-temperature tests, and to the production of pure oxygen and hydrogen for use in the several laboratories of the Bureau. Considerable work has been done in overhauling the liquid air and hydrogen plant, and in the design and construction of a new electrolytic generator for the production of oxygen and hydrogen.

The Fire-Resisting Properties of Structural Materials.

This investigation has been organized during the year. Its scope is so broad that it does not come within this division alone. The planning and carrying out of the high-temperature measurements,

the fire tests of structural materials, the determination of their thermal conductivities, etc., are receiving the attention of this division. The problems relating to the preparation and testing of concretes, tiles, bricks, steel structural material, etc., are receiving the attention of the concrete, ceramic, structural materials, and chemical laboratories of the Bureau; the electrical features of the investigation, such as safety rules for electric wiring, problems appertaining to the national electrical code, etc., are being looked after by the electrical division, while the behavior of these materials under heat as to their expansion, etc., is being investigated by the division of weights and measures.

The present investigation serves as an excellent illustration of the broad scope of an engineering investigation that requires the cooperation of nearly every one of the scientific and engineering laboratories of the Bureau.

During the past year considerable time was devoted to the organization of the work, assembling of the necessary equipment, etc.

One important investigation now well under way relates to the behavior of steel and cast-iron building columns under fire conditions, when exposed and when protected by various kinds and types of fireproofing. We are going ahead erecting buildings and accepting types of building construction, the integrity of which, in case of fire, will depend entirely on the behavior of the supporting steel columns. The building codes of different cities are entirely at variance as to the amount and kind of fireproofing required. It is therefore of the utmost importance that reliable engineering data be obtained on these questions, which are now too much matters of individual opinion. This investigation is being carried out in cooperation with the underwriters and mutual laboratories.

Another important phase of this investigation, which it is hoped will be gotten under way in the very near future, relates to the compiling of the various municipal building codes, not alone with a view to furnishing information to cities and others interested along these lines, but with a view to a comparative study of the codes to assist in planning a systematic program of investigation to answer those questions on which there are radical differences of opinion.

Testing.

A summary of the tests completed in this division during the year is given below.

Over 1,100 mercurial thermometers of various kinds were submitted for test, of which 910 were certified. These tests included many types of thermometers, such as low temperature, laboratory, high temperature, calorimetric, Beckmann, clinical standards, hydrometer, and special thermometers. Among the thermometers tested were included a number of working standards used by manufacturers to control the accuracy of thousands of thermometers put on the market. There were included in these tests 273 calorimetric and Beckmann thermometers intended for use in the determination of the heating values of fuels and many high-temperature thermometers intended to control various technical operations.

Ten thousand and seventy clinical thermometers were submitted for test, 90.7 per cent of which were certified and 9.3 per cent rejected for various causes, such as excessive error, retreating of index,

defects in construction, difficulty in throwing back index. These thermometers were submitted by the several medical bureaus of the Government, State medical institutions, manufacturers, hospitals, dealers, physicians, and individuals.

In addition to the above there were tested in the thermometer laboratory six calorimetric platinum resistance thermometers intended for the measurement of the small temperature changes met with in calorimetry with the highest attainable accuracy. These thermometers, which were developed in the laboratories of the Bureau and fully described in the Bulletin, are finding considerable use in technical and university laboratories.

Of all the thermometer tests summarized above, about 50 per cent were made for the public and the remainder for various technical bureaus of the Government.

Two hundred and seventy-four standard combustion samples of sugar, naphthalene, and benzoic acid were sent out during the year, against 152 during the preceding year, thus attesting to the growing demand for these samples for the standardization of calorimeters used for the determination of the heating values of fuels, and to the increasing practice of basing fuel contracts and specifications on heating-value tests. The standard samples were furnished at the cost of production to numerous industrial plants using large supplies of fuel, such as cement, steel, cotton, and paper mills; coal, oil, and gas companies; electric-power companies; chemical manufacturing plants, etc.; to university, municipal, State, and national testing laboratories and bureaus.

One gas calorimeter of the flow type and one combustion calorimeter of the bomb type were tested and certified. A number of careful determinations of the specific heats of analyzed samples of milk and creams were made for the Bureau of Animal Industry. An extensive series of tests of eight sample refrigerators, of four different sizes, were made for the Office of the Quartermaster General, War Department, as the basis for the award of large contracts. These tests related to ice consumption, temperature distribution, and air circulation within the refrigerators.

About 90 per cent of the calorimetric work was done for the public and the remainder for various bureaus of the Government.

In the high-temperature laboratories there were tested 92 thermocouples (platinum and base metal), 3 platinum resistance thermometers, 7 total radiation pyrometers, 14 optical pyrometers, 17 pyrometer galvanometers, 10 special tests, 26 determinations of melting points of refractories, such as fire and carborundum bricks, clays, infusorial earth, lavite, blast furnace slags, iron ore mixtures, etc.

These tests were submitted by a wide variety of interests, such as iron and steel plants and allied industries; cement, gas, and ceramic plants; electric manufacturing companies; manufacturers of high temperature apparatus, and of watches, tools, springs, axles, automobiles, etc.; technical and university laboratories, etc.

There has been a very marked increase in the amount of testing that the high-temperature laboratory has been called to do during the past year, amounting to above 75 per cent over that of the preceding year, and these demands are steadily increasing, which is satisfactory testimony that American industries are rapidly substituting

careful pyrometric control of high-temperature operations for the old method of eye estimation and other "hit or miss methods."

About 75 per cent of the high-temperature tests above summarized were made for the public and the remainder for various technical bureaus of the Government:

A rather comprehensive test of five electric stoves for heating engravers' plates was made for the Bureau of Printing and Engraving. These tests included measurements of efficiency, of degrees of uniformity of surface temperature, of rate of heating, etc., and were made as a test for a compliance with specifications and as a basis for the award of large contracts.

Two hundred and twenty-five samples of oils, inflammable materials, etc., were tested in this division. These tests were all made for various bureaus of the Government, and tests include determinations of viscosities and flash points for compliance of lubricating oils with specifications, or for their suitability for special uses, determinations of the flash and fire points of materials containing constituents that may make them dangerous in transportation on passenger carrying vessels, etc.

Information Furnished, Reports, etc.

An important feature of the work of this division has been the information that has been furnished by means of letters, and often quite lengthy reports, on subjects related to its lines of work. Several hundred such communications were prepared during the year. The requests for information come from nearly every type of industry in which technically trained men are employed, from national, State, and municipal laboratories and bureaus, from scientific investigators, and from committees of engineering and technical societies, and relate to a wide variety of problems, such as, by way of illustration—

- Report on fire extinguishers for use on passenger-carrying ships;
- Report on air conditioning equipment for the New York appraisers stores;
- Summary of scientific literature bearing on the experimental verification of the radiation laws;
- Report on the radiation constants of substances, collected from published scientific literature;
- The thermal constants of materials, the specific and latent heats of solid, liquid and gaseous substances; the melting points of metals, alloys, and refractories; the thermal conductivities of various materials, such as heat insulating materials used for cold-storage construction, for steel-car construction, for furnace construction, for steam-pipe covering, etc.; the heats of combustion of substances;
- Comparators, electric furnaces, etc., suitable for testing various types of thermometers and pyrometers;
- Metals and salts of known melting points for checking pyrometers in the works;
- Method of high-temperature measurement best suited to particular industrial requirements;
- Methods of determining various thermal constants such as specific heats, latent heats, melting points, conductivities, radiating properties, etc., and references to the scientific literature bearing thereon;
- Electric furnaces suitable for determination of fusing points of ash, ores, slags, etc.;
- Method of applying the cold-junction correction to thermocouple readings;
- The temperature of the Bunsen flame;
- Method of overcoming vibration of temperature measurements of instruments in steel mills;

The softening temperature of Seger cones used in the ceramic industries;
The making and burning of sillimanite and kaolin refractory tubes for use in high temperature laboratory work;
Radiation and convection from steam radiators; the reduction in heat loss from buildings by double windows;
Methods of calorimetric measurement; strength of bombs; use of standard heat samples, etc.;
The liquefaction of hydrogen; the separation of oxygen from air, etc.;
The definition of the British thermal unit, the calorie, etc.;
Specifications for various types of thermometers;
Legal requirements as to the flash points of oils, inflammables, etc.; methods of measuring viscosities; flash points found with different instruments; specifications for oils.

Technical and scientific men are constantly visiting the laboratories to consult with the men engaged on various lines of work, and in this way, as well as by correspondence, the work of the division is brought into intimate relation with the industries it is intended to serve.

New Work, Equipment, and Personnel.

It is deemed more important that opportunity be provided to complete the investigations already under way in this division rather than to take up any very extensive new lines of work, and yet there are some very important technical problems that the division should look forward to taking up within the next one or two years. These problems will be briefly outlined below.

The routine work of testing, which this division has been called on to do, has grown very rapidly, being over 50 per cent greater for the year just closed than for the preceding year, without any increase in the working force. This has necessarily resulted in delaying, and in many cases in stopping entirely, progress on important lines of investigation. Additional assistance is urgently needed.

Standard Melting-Point Samples.

A number of metals and salts, of accurately determined melting points, should be certified by the Bureau and supplied to technical men to enable them to conveniently check the accuracy of their pyrometers, just as the standard combustion samples now furnished by the Bureau serve to check heating value tests. Numerous requests have been received by the Bureau to furnish such standard melting-point samples. To meet this demand will require an outlay of about \$1,000 for a sufficient supply of materials to inaugurate the work and about half of the time of a minor assistant. The fees received for the standard samples would nearly, if not quite, pay for the work and materials.

New Equipment.

A number of important items of equipment, which have been deferred from year to year, are urgently needed and should be provided for, such as bomb calorimeters, electric furnaces, heavy current transformers and rheostats, thermocouples, radiation pyrometer, and refractory porcelain for high-temperature work.

3. ELECTRICITY.

Equipping New Electrical Laboratory.

During the first half of the fiscal year the new electrical laboratory was equipped with pipes, wires, switchboards, storage batteries, and other necessary equipment, and the machinery and apparatus moved in from the rooms in three different buildings previously occupied. The large amount of time required for the moving and setting up of apparatus has interfered to some extent with the work of research and testing. Nevertheless, the results of the year show that a considerable quantity of both have been done.

Fundamental Electrical Standards.

The investigations upon the Weston cell as the standard of electromotive force have been continued. An intimate study of the methods of preparing the chemicals used has revealed sources of small variations hitherto unsuspected, and the cell as now made is much more constant in value and more reproducible than formerly. Considerable progress has been made in the attempt to remedy the cracking of the Clark cell, which has heretofore been a serious defect of the cell.

The work on the mercury ohm has been completed, and the report upon it will shortly be ready for publication.

The investigation on the silver voltameter has been continued and two papers published during the year. One was Part IV of the general investigation, and deals with the purity of the materials and other questions affecting the accuracy of the standard, and the other was a paper on the relation of the silver voltameter to the iodine voltameter. This work is of great importance in permitting the international definition of current to be specified with greater accuracy. Specifications for the use of the silver voltameter are being prepared, based on the extensive experience of the Bureau.

Electric-Measuring Instruments.

The methods of testing potentiometers have been thoroughly investigated. New methods for carrying out these tests rapidly and with the highest precision were devised and applied. These instruments are the fundamental means of accurate measurements of voltage, current, and power, and their accurate calibration is important.

Transformer Formulas.

A study has been made of the formulas which represent the behavior of transformers. The formulas in common use depend upon certain assumptions and approximations, which had never before been thoroughly examined. This work makes it possible to predict with greater certainty the behavior of a transformer from its measured characteristics.

Potential Transformers.

A simple method of testing potential transformers has been perfected. The method requires the use merely of wattmeters and other ordinary instruments about a central station. Instrument transformers are in use in central stations where large quantities of

electric power are handled. It should prove of great use to have an accurate method available of standardizing these important transformers which requires only apparatus of the most ordinary sort.

Sensitive Galvanometers.

The object of the investigation is to produce galvanometers which are more sensitive and better adapted to the various needs of the Bureau than are the galvanometers which are on the market. The work will include the determination of constants and behavior of instruments of different make; the study of the theory in the light of the experimental data, and the development of a definite procedure for the design of instruments to have previously selected values of operating constants.

Vibration Electrometer.

Another need which has been felt in alternating-current testing has been met by the design and construction of a vibration electrometer. This instrument is capable of measuring extremely small alternating currents, such as are used in the comparison of small electrostatic capacities.

High-Frequency Instruments.

An investigation was made of the ammeters used in radiotelegraphy. Every radio station has one of these instruments for the measurement of the high-frequency currents used. In many cases they are very unreliable. The sources of error were discovered by a rigid theoretical and experimental research, and means were devised for overcoming the errors and bettering the designs. Some of the work strengthened the application of alternating-current theory to high-frequency measurements.

Decremeter for Radiotelegraphy.

The decrement or rate of decay of the trains of waves emitted by radiotelegraphic antenna is limited by law. The inspectors of this Department have the duty of enforcing the law, and there was heretofore no instrument by which the measurement of decrement could be made with speed and accuracy. A decrometer was therefore designed which has proved itself to be very satisfactory in practice, and which has been adopted by the War and Navy Departments, and by the Bureau of Navigation of the Department of Commerce for the use of its inspectors.

The Standardization of Electric Wave Meters.

It is proposed to set up standard circuits of known frequency in order to show what conditions affect the precision of wave meter measurements and to improve the accuracy of such measurements; also to give typical examples of the behavior of various wave meters.

Inductance, etc.

A study is being made of the effective resistance of copper-clad iron and steel wires to obtain data concerning the electrical properties of conductors containing an iron core over a considerable range of sizes, current strengths, frequencies, and magnetic properties. Such data can only be determined experimentally, and no previous

work has covered the field. Such conductors are used commercially in telephone, telegraph, and power transmission work.

Methods for measuring the inductances of very small resistances were devised and tried out. These methods increase the accuracy of alternating-current tests at the Bureau and other standardizing institutions.

Properties of Dielectrics.

An investigation of the insulating properties of solid dielectrics has been in progress for some years. The insulating materials used in electrical work are many, and the accuracy of all electrical measurements depends on the reliability of the insulators. Hard rubber and its many substitutes are the most important in the building of electrical measuring instruments. A great many of those in common use were tested for leakage of current through the material and across the surface of the insulator. The effect of leakage across the surface of these substances is tremendous, some of them having a resistance millions of times as great in dry weather as in damp weather.

The Decrements of Coupled Circuits.

The object is to establish with greater certainty the formulas used in the measurement of high-frequency resistance, to extend the known formulas if possible, to find an expression for the errors in these formulas, and to make available in English much material hitherto in German only.

Magnetism.

Much work has been done on the relation of magnetic to mechanical properties of steel. The steels investigated cover a considerable variety of chemical composition and thermal treatment. Full-sized steel rails are included in the investigation. It is hoped that the information obtained will be of great value in the practical testing of steel. It has been found that the permeability of ordinary steels changes appreciably with temperature. This is under further investigation.

The study of core loss at the higher inductions has progressed rather slowly owing to difficulties met in the determination of the form of the wave of electromotive force. The bismuth spiral, well known as a convenient means of measuring magnetic fields, has been found to have several peculiar properties. Careful study of this is in progress. These lines of work are of the greatest interest to electrical engineers and to research laboratories.

Radium.

The intercomparison of sealed radium standards and the study of the gamma-ray method of radium measurement have made satisfactory progress, and very accurate measurements are now regularly made. Studies are being conducted of the alpha-ray activity of powdered material, of the activity of uranium mixtures, and of radium ores and radium emanation. The radium laboratory has made numerous tests of specimens to determine the amount of radium present, and hence the money value.

Gas Photometry.

The pentane lamp as a working standard in measuring the candlepower of gas flames has been under investigation for some years. A paper on this lamp as a working standard was published. The information given enables municipal inspectors, gas companies, and others to obtain more accurate measurements than heretofore, by taking proper precautions in the use of the lamp.

Flame Standards in Photometry is another paper published during the year. This gives results obtained on the Hefner and pentane lamps with regard to their reproducibility and the effect of variations in atmospheric humidity and barometric pressure.

Color Photometry.

Considerable progress was made during the year on the difficult problem of color photometry, i. e., measuring the candlepower of lamps having widely different colors. One of the most convenient methods is by the use of colored glasses to bring the lamps to a color match, but the calibration of these glasses must first be made. The percentage of light transmitted by these glasses for different colors and under various conditions was studied: The equations of the curves expressing the relation between candlepower and voltage, watts per candle and voltage, etc., have been derived for tungsten lamps, and it is found that they apply very exactly for lamps of different makes and even of different methods of manufacture. Their use will permit standard lamps to be used at any desired color or efficiency within a considerable range, and thereby avoid color differences in measurements. The work is nearly ready for publication.

Effect of Atmospheric Conditions on Flame Standards.

A study is being made of the effects of atmospheric conditions on flames, particularly to determine effects of barometric pressure and of humidity on the intensity of the light emitted by flame standards of candlepower and by gas flames. The work will include photometric measurements on flames under varying natural conditions, and similar measurements on flames in an inclosure to which a compressor furnishes air under high or low pressure, variations in humidity being obtained by drawing the air through water or over drying material. Results so far obtained are of great interest and importance, and the work will shortly be ready for publication.

Electrical Testing.

The following list of instruments and materials tested during the year is arranged in six groups, corresponding to the six sections in which the electrical testing is done. The more important tests for the Government are so marked. The remainder are nearly all for the public.

The following tests were made of standard cells, standards of resistance, resistance apparatus, and electric conductivity of materials: 85 portable or unsaturated Weston cells, 4 saturated Weston cells, 69 resistance standards, 9 shunts, for current standards, 3 volt boxes, 4 potentiometers, 1 slide wire, 2 Wheatstone bridges, 3 resistance boxes, and 58 conductivity samples (42 for the Government).

The tests of inductance, capacity, radium, and radioactive substances included: 19 electric condensers, 10 samples of telephone cable, 15 inductances, 2 tests of insulation resistance, and 28 specimens of radium salts (aggregate value of the radium contained, \$58,000).

The tests of electrical measuring instruments, transformers, etc., included: 15 voltmeters, 19 ammeters, 7 wattmeters, 29 watthour meters, 12 instrument transformers, 1 frequency meter, 56 dry cells, 4 primary cells, 24 wire samples, 2 porcelain spools, 178 pairs rubber gloves (for the Government), 41 electric fans (for General Supply Committee), 5 samples of insulating varnish, 7 telephone jacks, and 2 recording potentiometers.

Wavemeters, decremeters, high-frequency ammeters included: 4 wavemeters, 35 decremeters (for the Army and Navy and Bureau of Navigation), and 2 high-frequency ammeters.

Magnetic materials were tested to the extent of 78 permeability and hysteresis tests of iron, and 24 core loss in sheet iron.

Photometric testing, 109 electric lamps were tested for candle-power, and 1,800 tungsten and carbon filament lamps were tested for life, and 1,092,549 tungsten and carbon lamps were inspected for the various Government departments.

Other photometric tests included: 12 pentane lamps for photometric standards, 23 reflectors, 7 portable photometers, 2 arc lamps, and 14 street series tungsten lamps.

Information Furnished on Electrical Subjects.

In addition to information furnished in connection with the various investigations and tests, the electrical division has furnished miscellaneous information on a great variety of subjects.

Requests have been answered for definitions of units from the American Society of Mechanical Engineers, from the French Government committee on systems of units, and from editors and others. There has been some difficulty in furnishing full information on the electric units and standards, as there is no single, consistent compilation of data on this subject. Because of this fact, work has been begun upon a circular treating the subject in a complete and thorough manner.

There are occasional requests for revision of physical tables. Considerable data were furnished for the Smithsonian Physical Tables, for a special book of "Conversion Tables," and for other sets of tables.

The numerous inquiries regarding electric measuring instruments are in many cases answered by sending the inquirer a copy of the Bureau circular on this subject. The many developments and improvements of the last five years in this field required a revision of the circular. This has been done, and the circular is now thoroughly abreast of the times and is a valuable compendium of information.

The Bureau has furnished considerable information regarding the electrical constants of copper to the International Electrotechnical Commission, through its American committee. The investigation on the conductivity and temperature coefficient of resistance of copper, which was conducted here in 1910, was considered a suitable basis for an international standard. Such a standard is useful for the expression of per cent conductivity, and in the preparation of wire tables.

The question was considered by international committees and by the committees of various national engineering societies. Information was sought from the Bureau at all stages of this consideration. Besides furnishing the data asked for, the Bureau prepared a very complete set of copper-wire tables, with explanations and historical discussions of the allied subjects.

This work culminated in the adoption of the values upon which our tables are based as international standards. This action was taken by the International Electrotechnical Commission in plenary session at Berlin in September, 1913. The circular on this subject has since then been revised and a new edition prepared. The new copper standards have been adopted in the 1914 Standardization Rules of the American Institute of Electrical Engineers. The British engineering standards committee also has taken up the work of revising its tables to bring them into conformity with the international standard. This is the first time that the electrical engineers of all nations have had a common standard for copper. Following the international adoption, there was considerable correspondence with the commission and with the other national standardizing laboratories to settle certain questions regarding the numerical values.

In the revision of its standardization rules, some assistance has been rendered the American Institute of Electrical Engineers. This assistance includes the furnishing by the Bureau of the material for the new section on wire and cable standardization. There was considerable discussion and correspondence regarding some of the definitions, and two discussions of certain provisions of the rules were published in the technical press by members of the division.

Some inquiries on the definitions of units of force and power have arisen as a result of the Bureau's circular on horsepower. These have led to a thorough revision of said circular, with the addition of discussions of the units of force and standard values of gravity.

There have been numerous letters asking the Bureau to pass an opinion upon pseudoscientific discoveries and inventions. Men of limited education or equipment who believe they have made wonderful and revolutionary discoveries often possess extraordinary confidence in themselves and their work, and it is exceedingly difficult to convince them of the fact that some things are definitely known to be impossible. The Bureau has, however, been able to render some service to the public by replying to inquiries concerning the worth of some of these schemes, especially those in the perpetual-motion class.

Investigators and radiotelegraphic companies have sought information on the calculation of inductances. Some of these inquiries could be answered by reference to our Bulletin articles on the subject, while others required some independent work.

In the field of radiotelegraphy, the Bureau has been called on for considerable information. Assistance has been rendered the Bureau of Navigation of this Department on questions relating to the measurement of wave length and decrement, interference caused by arc stations, and transmitting and emergency sets. As a result of our advice on the latter subject, the ships equipped by certain commercial companies have discarded the emergency sets formerly used and adopted others, based on the methods suggested. Information has been furnished regarding the radio equipment of small boats such as revenue cutters, and of lighthouses for fog signaling.

Amateurs have sought information regarding the legal regulations and regarding operating questions. These inquiries make it appear that a general circular of information on radiotelegraphy for amateurs and others would be very desirable, and the preparation of such a circular is projected for the coming year.

The work already done on sensitive galvanometers has made it possible to furnish information to various investigators as to the construction of very sensitive instruments for special purposes.

There have been many inquiries regarding the testing of radium and of radioactive waters and allied questions.

In magnetism there have been requests for typical data on the magnetic constants of various grades of steel used for electromagnets and permanent magnets. Reliable data on these matters would be very valuable, but have never been collected from the abundant literature. The necessary time has not yet been found to take it up systematically.

Information has been furnished as far as available in the subjects of street-lighting specifications, headlights and projectors, and illuminating-oil specifications.

Public-Utility Investigations.

The above statements of investigations completed or nearly completed, of publications, of testing, and information supplied to the Government and the public, covers in large part, though not completely, the work of the electrical division, which consists principally of laboratory work and testing. The remaining work has to do largely with public-utilities service, and consists of scientific and engineering researches, the study of public-relations questions, and the collection and distribution of information. This work may conveniently be described as follows under separate headings.

Service and Standards for Illuminating Gas.

This work has been carried on for several years under the direction of the electrical division, with the cooperation of other divisions of the Bureau, especially the chemical and heat divisions. Regulations for gas service, as made by cities or State commissions, include among other things the requirements as to meter accuracy and the testing of meters, the specifications of the heating value or candle-power of the gas (or both), the degree of chemical purity as expressed by the limits set to the amounts of sulphur and ammonia that are permitted, the variations in pressure that may be allowed, and the manner and frequency of tests to determine whether the operating companies conform to the requirements.

In addition to investigations carried on by the Bureau for the past five years on these subjects, which have resulted in a considerable number of papers published in the Bureau's scientific and technological series, a thorough study was made of the rules and regulations of cities and States, and a thorough discussion made of the subject in Bureau Circular No. 32, first published three years ago. This was revised and republished a year ago and is now being revised for its third edition. This publication has had a wide circulation and serves a useful purpose in setting forth the proper basis for regulations, discussions as to the relation between the quality of gas

and the efficiency of manufacturing processes, and the most satisfactory terms of specifications of quality and methods of testing.

Another publication which will shortly be issued is Circular No. 48, which will give a detailed technical discussion of methods of gas testing. This will be the joint work of several divisions of the Bureau.

The Bureau has given assistance to a considerable number of State commissions and cities in connection with the adoption of ordinances or orders regarding gas service, and has sent a representative to a number of public hearings conducted by State commissions. It is of much importance that the regulations and requirements of the several States and cities shall be as uniform as consistent with progress and justice to the companies and the public. The Bureau aims to serve in some measure as a clearing house of information on many of the scientific and public relations questions arising in connection with the regulation of gas companies, and to be perfectly impartial as between the companies and the public.

Another important work in which the Bureau hopes to do more during the coming year is the inspection of testing laboratories and equipment, both of companies and the public, with a view of getting information for our own use and of giving suggestions or information that would improve the accuracy or efficiency of the testing. The information secured would be used in connection with publications on laboratory equipment and testing methods. It would enable the Bureau to keep in closer touch with the industry and the regulating bodies that represent the public and to give more valuable information when called upon.

One of the most important and at the same time difficult questions for a regulatory body to decide is the quality of gas that shall be specified. Gas is measured by meters, which register in proportion to the volume of gas passing, expressed in cubic feet. This volume of a given mass of gas varies according to its temperature and pressure, the latter varying with altitude above sea level. It is its mass or effective quantity that determines its usefulness, rather than its volume merely, and hence some very complicated questions arise when one attempts to prescribe how it shall be measured and tested and be fair and just both to the company and the public. The Bureau has discussed these questions fully in its publications, and has recently carried out some extensive measurements on the variation of the light of pentane and Hefner standard lamps with atmospheric pressure, and the variation of the luminous efficiency of gas flames with the pressure of the atmosphere.

Electrolysis Mitigation.

The greater portion of the street railways of the country are operated on the single overhead-trolley plan, with the electric current flowing into the rails through the car wheels, after it has passed through the car motors. The current then flows back to the generating station or substation by way of the tracks and earth, much of it, however, often flowing through underground gas and water pipes and the lead sheaths of underground telephone and electric light cables, and sometimes through reinforced concrete structures. The earth conducts electricity by virtue of its moisture and the salts dissolved in it, which renders it an electrolyte. Hence, when the

electric current flows away from iron pipes or lead cable sheaths, it carries away iron or lead by electrolytic action, and this in time often eats holes into the pipes and sometimes completely destroys them.

The trouble is the more serious in places where the soil has a greater conductivity than usual, and also where the car tracks are fewer in proportion to the current, and the distance the current travels back to the stations is relatively great. Many remedies have been proposed and tried, but no standard practice for the handling of the return current has ever been agreed upon in this country. As the electric railways have been extended and traffic has become heavier, the volume of current handled has increased very greatly, and the destructive effects of these currents, which are cumulative with time, have become increasingly evident. In some cases litigation has resulted between the pipe-owning companies suffering damage, and the railway companies whose current caused the trouble. But although the courts have considered the question of legal responsibility, these cases did very little to prevent the trouble in an effective and economical manner.

The Bureau has been studying the question for the past four years, and has done a large amount of work in connection with it. This has included laboratory investigations concerning the effects of electric current on concrete and metal pipes, tests of pipe coverings, the corrosion of metals in the soil, methods of measuring soil resistance and various other experimental phases of the work; methods of electrolysis mitigation that have been used or proposed and the results obtained; field studies in actual practice with the application of remedies and a determination of the cost and results obtained.

During the past year work was done in St. Louis, Springfield, and Elyria, Ohio, and Springfield, Mass., and reports prepared, some of which were published during the year.

The recent electrolysis survey in Springfield, Mass., was made at the invitation of the city of Springfield, and most of the public-utility companies of the city, including the gas, electric light, telephone and telegraph companies. The railway company did not unite in the invitation, but gave the engineers of the Bureau free access to its property and full information regarding its currents, cables, and station operation. The cost of the survey and the report is borne in part by the Bureau and in part by the utilities. The object of the work is not merely to benefit Springfield, but to demonstrate the method of procedure in making electrolysis surveys, and in securing relief from electrolytic corrosion in an efficient and economical manner.

This work will be continued during the coming year, and it is hoped that the Bureau's work will induce railway, gas, and water companies generally to make electrolysis surveys, and the railways to giving more attention to bonding of tracks and the provision of adequate return conductors for their current, so that less current will get into gas and water pipes and cable sheaths.

The work of the Bureau has been received most favorably by many railway officials and engineers, but very many still feel that it is a hardship to provide adequate conductors for the return current, having for so long been accustomed to turning it loose in the earth to return as best it could.

The following technologic papers on this subject were issued during the year:

Surface Insulation of Pipes as a Means of Preventing Electrolysis (No. 15), an experimental study of a great number of pipes, coatings, and wrappings, and the effects on the electrolytic corrosion of underground pipes.

Electrolytic Corrosion of Iron in Soils (No. 25), a study of the effect of current density, moisture, temperature, and oxygen upon the corrosion of pipes, and the bearing of the results obtained upon electrolysis mitigation in practice.

Special Studies in Electrolysis Mitigation, No. 1 (No. 27), a preliminary study of conditions in Springfield, Ohio, with recommendations for mitigation.

Special Studies in Electrolysis Mitigation, No. 2 (No. 32), an experimental test on a system of insulated negative feeders in St. Louis.

Electric Light and Power Service.

During the past year we have been studying the question of the specifications of electric light and power service, and the requirements that should be made by cities or State commissions of public-utility companies furnishing such service. This study is similar to the studies described above concerning gas service for heating and illumination. The principal factors of such service are its quality and reliability, and the accuracy of the meters that measure it. Steadiness of voltage, without which electric lighting is not satisfactory, and continuity of service are phases of quality that have sometimes been included in regulatory ordinances, while the permissible errors of meters and frequency of testing of the same are almost always included. As the requirements that can fairly be made vary under different conditions, and as there has been relatively little experience so far in the enforcement of some of these requirements, there is ample room for study by the Bureau, this study including consultation with a great many operating companies and the collection of results obtained under various kinds of regulatory ordinances.

The feasibility of making requirements of this kind in the case of the smaller utilities is a question deserving careful study. The extent to which automatic voltage regulators, recording voltmeters, pressure wires and instrument and meter-testing outfits can be utilized by such small companies without undue hardship, and possibly a resulting detriment to their customers, is a question of great practical importance, and we are planning to give considerable attention to it during the next fiscal year.

During the past year the Bureau answered many inquiries for information, assisted cities and commissions in preparing regulations, while a representative of the Bureau has conferred with numerous companies and commissions regarding the questions we are studying. Here, as in other lines of our public-utility work, we aim to serve in some degree as a clearing house of information, although this work is so recently established that it has so far made only a beginning. An increased force is much needed to strengthen the work.

Life Hazard in Electrical Practice.

For many years the National Fire Protection Association has studied the question of fire hazard due to electrical apparatus and machinery and conductors carrying electric currents, and the underwriter's code, prepared and frequently revised by this association, has been generally adopted and enforced in order to reduce the fire hazard. But there has been no national body doing a corresponding

work to reduce the life hazard, while the number of serious accidents and fatalities to linemen and other employees and the public has been increasing year by year.

The matter became so serious that the Bureau secured from Congress authorization and a special appropriation to study the question. During the past year this study has been in progress, with a view to preparing safety rules to be observed in the construction and operation of electric light and power plants, and in the distribution and utilization of electricity. Attention is given also to the fire hazard, and in this we are cooperating with the underwriter's laboratories and the National Fire Protection Association. The first set of rules on the operation of electrical equipment and lines has been completed, with the cordial cooperation of many electrical companies and public bodies, such as State public-service commissions and State industrial commissions. It is expected that these rules will be widely adopted, and will tend to reduce accidents and assist in securing a much desired uniformity of practice among the different States.

An interest has been awakened throughout the country in the question of greater safety, and the work of the Bureau in the more technical aspects of this safety movement so far as the electrical industries are concerned, is very timely. The public is vitally concerned, also, for the use of electricity is so general, both in the household, in the industries, and in transportation, and its distribution circuits form such a network in most communities that one can not know when he is free from danger unless there is close public supervision both as to construction and operation. Effective supervision requires adequate and carefully prepared rules or specifications that can be readily understood and intelligently followed.

This work will be continued and enlarged during the next fiscal year by the addition of another engineer to the two already engaged in this work.

Illuminating Engineering.

Provision is needed to enable the Bureau to take up in an adequate manner the many urgent problems in illuminating engineering. The lighting of streets and public spaces, public buildings and auditoriums, stores, factories, and private homes is a matter that is receiving a great deal of attention in recent years, and a great many new and improved methods, as well as fixtures and appliances for the purpose have been developed; but reliable information as to the value of much of this material is hard to obtain.

The claims made by manufacturers are often conflicting, and there is great need for an unbiased agency, such as the Bureau of Standards, to make photometric and other tests and to determine the performance of the appliances that are on the market. For the use of the Government, States, and cities alone such information would be of great value, but it would also be of immense value to the general public, and particularly to architects and contractors who are specifying and purchasing such appliances. We know also from tests that we have made that improvements at practically no cost could often be made if the necessary information were available. The subject is a highly technical one and directly in line with the Bureau's work, and a moderate appropriation would yield valuable results.

Radiotelegraphy Research Laboratory.

One of the important needs of the Bureau is appropriate space for research in radio communication, or wireless telegraphy, as it is usually called. For several years the Bureau has afforded space and experimental facilities to the Army and Navy for certain of their investigations in this subject, and has itself done some research work of this kind besides doing testing of instruments used in wireless measurements. But with the rapid development of wireless, the increase in the power used and the distances reached, and especially with its general use at sea for all kinds of service, the small space and meager facilities that can be spared are entirely inadequate. To meet the present needs as to space and experimental facilities, a separate building with special facilities should be provided.

An estimate was submitted last year for \$50,000 to erect such a building, but the appropriation was not made. It is recommended that this item be again included in the estimates for the coming year. It is proposed to locate this laboratory directly south of the electrical laboratory, connecting it by a pipe and wire tunnel, so that the experimental machines and sources of current of the electrical laboratory shall be available. This building would provide accommodations for the work of the Army and Navy that has been located at the Bureau for several years. In addition to the sum estimated for the building, an additional sum will be needed later for apparatus and equipment.

Additional Facilities Needed.

With the additional space afforded by the new electrical laboratory building, the electrical division is now in much better condition to do its work than heretofore. Owing to the pressure of testing, however, the research work in some lines has suffered in recent years, and it is hoped that several additional assistants can be provided. In the matter of absolute electrical measurements, in which the Bureau has done conspicuous work in the past, there is needed an additional force to replace those drawn off to do other work for which there was urgent demand. Considerable new apparatus is also needed to make the equipment satisfactory for the work to be done.

The sum available for work on public-utility problems should be increased, to enable the work to be done better and to permit taking up some phases of the work not so far touched.

4. OPTICS.

Determination of Standard Wave Lengths.

The determination of standard wave lengths of light throughout the entire spectrum is at present confined to fundamental work that must be done before wave lengths can be accurately determined. This is being done by the Bureau, in accordance with the recommendations of the International Solar Union, a body whose membership comprises the greater part of the eminent spectroscopist of the world. While the results are needed mainly by scientists, they are also necessary in the industries. For example, the spectroscopic analysis of steel and other substances can not be successfully undertaken until

the characteristics of the spectra of the constituents are more accurately observed. This requires wave lengths of standard or known values. The instruments necessary for carrying on this investigation have been designed during the past year. That part of the apparatus necessary for the work in the ultra-violet part of the spectrum has been constructed and found to be satisfactory. The mounting of a concave grating spectroscope is in progress. About one-seventh of the measures of standard wave lengths have been completed.

Spectroscopic Testing.

Spectroscopic tests have been made of the transmission of glass for the ultra-violet rays, mainly with a view to determining their fitness for spectacle making. Assistance has been rendered to several departments of the Government and to various individuals and firms. Spectroscopic measurements are becoming more and more important, not only in scientific work but in illuminating engineering, the testing of materials, and industrial processes. Such tests are often useful to determine the presence of elements in very minute quantities. With the new grating spectroscope it will be possible to take up this work more effectually.

Standard Samples of Pure Gases.

There have been several demands for standards of pure gases. While the spectroscopic division will soon be able to test the purity of gases, it is not yet feasible to undertake to furnish gases in a state of sufficient purity to serve as standard samples.

Polarimetry.

The polariscope and its accessories are the indispensable adjuncts of the refined-sugar manufacturer, the beet and the cane sugar planter, public sugar chemists, and the customs sugar laboratories. In addition, they are part of the regular physical and chemical equipment used in other industries as well as institutions of learning. The importance of the investigation and standardization of this apparatus has seldom been appreciated by other than scientific workers; it has been found necessary to discard many of the results and methods of the past. In addition to a common basis of standardization, a unification of methods is necessary if the results of different laboratories are to be brought into agreement. During the past year a circular (No. 44), entitled "Polarimetry," has been completed and given a fairly wide distribution among workers in this field. This circular describes approved methods of polarimetric analysis, and shows improved types of apparatus, some of which have been developed at the Bureau.

Conference of Polarimetric Experts.

The general interest aroused in polarimetry by the distribution of this circular has suggested the calling of a general conference of those interested in polarimetric work. The numerous troublesome questions arising from differences in methods would be discussed and probably eliminated. There would also result a wider dissemination of information relative to the standards adopted by the Bureau than could be secured in any other manner.

Influence of Atmospheric Conditions in the Polarimetric Testing of Sugars.

A research of importance to the sugar industry, and of considerable theoretical moment, has been completed on the influence of atmospheric conditions in the polarimetric testing of sugars. The influence of atmospheric conditions on the testing of sugars has not been well understood, owing to the difficulty of controlling both temperature and humidity in the research laboratory. Relatively large and inexplicable differences have been noted for some time between the tests on imported sugars for the collection of duty at the various ports of entry. So great have been these differences that it is probable that sugars have purposely been imported via certain ports with the intent of paying a lower rate of duty. The Bureau's investigations not only shows the exact cause of the differences, but also a simple and certain method of eliminating them.

Study of the Basic Lead Acetates.

Another polarimetric investigation consisted of a study of the basic acetates of lead used for the clarification of the opaque solutions of raw sugars for optical analysis. This research has covered ground which is essentially new and has shown what basic acetates of lead may exist and what is their behavior in aqueous solution. It has been shown that most of the previous work on this subject is in error.

Determination of the 100-degree Point of the Saccharimeter.

This research has been under way for several years, and the results are now being prepared for publication. Being essentially precision measurements of fundamental constants, the greatest care is being exercised to insure the accuracy of the values. By this investigation the Bureau has established the most important fact that the basis of calibration of the saccharimeter (a particular form of polariscope), used the world over in sugar analyses, is in error by over one-tenth of 1 per cent, resulting in a considerable loss to the Government in duties collected on imported sugars and, in addition, the producers of raw sugars have received less compensation than they should have received.

Precision Polariscope.

The large polariscope designed and built by the Bureau for magneto-optical work has been tested and found satisfactory. This equipment now constitutes an invaluable auxiliary for the study of optically active substances, as well as substances not in themselves active, and has opened up a large and important field for investigation.

Preparation of Standard Sugars.

The work on the preparation of dextrose has been continued and standard samples have been issued. This substance which is prepared in the laboratory from the crude glucose is intended as a standard to assist in bringing about uniformity of analysis of a class of substances known as reducing sugars. The investigation of dextrose will be continued. Fifty-eight standard samples of sucrose and seven samples of dextrose were furnished to the public.

Another substance which occurs in sugar mixtures to a slightly less extent than dextrose is levulose. The rotation of this substance

has been but little studied, although its frequent occurrence necessitates continual use of such data as exist. The pure substance is prepared with very great difficulty, but a considerable quantity has been prepared, and during the ensuing year the Bureau will be able to begin the measurements upon it.

Supervision of the Customs Service Sugar-Testing Laboratories.

The important changes made a year ago, including the introduction of the bichromate light filter and the improved polariscope tube, have given excellent results, and the systematic differences existing between the tests of the various ports of entry have grown less. Protests on sugar entries have practically been eliminated.

The Bureau cooperates with the Customs Service in all matters pertaining to the weighing, taring, sampling, and polarization of imported sugars and molasses. The regulations governing the polarimetric work of the Customs Service, and which were prepared in cooperation with the Bureau, are given as an appendix in the polarimetric circular.

Polariscopic Testing.

During the year approximately 1,500 polarizations of sugar were made principally in connection with the control samples sent daily from the various ports of entry for sugar.

Interferometry.

By interferometry is meant measurement of length where the principle of interference of light is applied and where light waves of a particular length are used as a working standard. This method is susceptible of great accuracy, and is particularly adapted to the measurement of very small lengths or changes in length. By it, changes as small as the one-millionth of an inch or even smaller may be measured under favorable circumstances. Important applications are now being made at the Bureau as given below.

Expansion of Materials Due to Temperature Changes.

New apparatus has been designed for temperature control and regulation in measurement of expansion of small samples (a few millimeters, i. e., less than one-half inch), by interference methods. This apparatus was nearly ready at the end of the year. Measurement of the expansion of small samples from steel in connection with the investigation of properties of rails was pending at the close of the year.

Planeness and Parallelism of Surfaces.

A number of tests of planeness and parallelism of optical surfaces and gauges have been made by means of interference methods. The high degree of accuracy required in optical work of this nature can only be secured by the use of this method. It is no unusual matter for the optician to work to the one-hundred thousandth part of an inch or less in the preparation of plane surfaces, which are often quite as essential as a lens in the optical system of an instrument.

Determinations of the Optic Axes of Crystals.

The determination by interference methods of the direction of the optic axis, in quartz plates, such as are required for standards in

sugar analysis, color specifications and expansion measurements, has now been reduced to a satisfactory routine. A number of plates, most of which were constructed in the Bureau's optical shop, have been tested.

Specification and Measurement of Color.

The investigation of methods of specification and measurement of the color of cottonseed oil, undertaken at the request of the Society of Cotton Products Analysts, has been continued. Extensive tests of the applicability of the quartz colorimeter to this problem were made in cooperation with that society, and an instrument was designed and constructed at the Bureau for use in this connection.

The investigation of methods of specifying the color of butter and oleomargarine has been continued at the request of the National Dairy Union, and the Dairy and Food Department of the State of Minnesota. A new method has been devised which it is expected will simplify and facilitate the specification of the color of these particular substances. Some tests of this method were made, and the results communicated to the National Dairy Union. Preparation has been made for carrying out further tests in cooperation with the Dairy and Food Department of Minnesota.

An investigation of rosin colors and proposed standards for the color of rosin has been undertaken at the request of the Bureau of Chemistry of the Department of Agriculture. Partial reports have been made and the work was in progress at the close of the year.

The question of color standards, the specification of color and color measurement, is of such pressing importance to so many industries—such as paper making, lithography, ceramics, textiles, dairy products, paints, oils, dyes, inks, and others—that a special appropriation should be procured to enable the Bureau to expedite this work, which can only be taken up in a limited way with the present staff and equipment.

Colorimetric Testing.

Tests involving about 25 different samples and several thousand observations by different observers have been made in colorimetry and spectrophotometry. There has been a marked increase in the demand for tests of spectral transmission, i. e., the relative transmission of substances for light of different wave lengths. Tests of this kind have been made for glass manufacturers, opticians and consulting engineers. Three pairs of smoked glass photometric wedges have been calibrated for the Johns Hopkins University. Extensive tests of the color of oleomargarine have been made for the National Dairy Union.

Information as to Color Specification and Measurement.

Information relative to the specification and measurement of color has been given to many individuals and firms, as well as to the Society of Cotton Products Analysts, the National Dairy Union, the Bureau of Chemistry of the Department of Agriculture, and to the American Society for Testing Materials. A color screen of prescribed properties designed to reduce sunlight to skylight was prepared and tested at the request of the Weather Bureau.

Color Blindness.

Some attention has been given to methods of testing for color blindness and defective color vision. This question is now of pressing importance to the Bureau in connection with the observers in colorimetry and photometry.

Turbidimetry.

To meet a long-felt need for a more precise standard of turbidity, especially in water analysis, a new instrument for measuring turbidity, known as a "turbidimeter," has been designed and constructed. It has been found satisfactory, and extremely sensitive. An improved instrument is being made which will be suitable for use in standardizing the turbidity not only of liquids, but of gases and solid plates.

The committee on the revision of the standard methods of water analysis, of the American Public Health Association, and the American Chemical Society, have asked the Bureau to cooperate in the revision of the standard of turbidity. An adaptation of the turbidimeter is being planned to be used in the study of fog as a part of the work of the international ice patrol.

Transparency, Translucency, Diffusion.

Methods have been developed and put into practice for testing of transparency, translucency, and opacity of materials, such as glass, paper, and tracing cloth. There has been a marked demand for such tests. Tests of this kind have been made for the Post Office Department and the Customs Service, and for firms or dealers in tracing cloth.

Tests of the distribution of light transmitted by skylight glass were also made.

Investigation and Design of Optical Systems.

The essential feature of many optical instruments often consists of a system of lenses, mirrors, prisms, or other optical parts. The investigation, design, and testing of these optical systems forms one of the principal lines of optical work in the Bureau, as such instruments are in very general use, both in scientific work and by the public. Microscopes, telescopes, field glasses, and photographic lenses are examples.

Apparatus has been designed and constructed for the purpose of obtaining the axial light transmission of optical instruments. This transmission is the ratio of the light which actually reaches the eye, to that which would reach the eye through an exactly similar instrument composed of ideal lenses having no loss either by reflection or absorption. The principal application of these measurements has been to telescopes of all kinds, especially those intended for use under exacting conditions of light. Some have been found which transmitted much more than others, and the indications are that such instruments will be improved in this respect.

The determinations of the secondary standards of wave lengths require the use of a special spectroscope giving good definition along a spectrum line instead of across the line as in the usual types. The optical system of such a spectroscope has been designed and com-

puted. The system is composed of quartz and rock salt and gives a flat field over a long region of wave lengths in the ultra-violet part of the spectrum.

The design of a special photograph lens having a large flat field has been undertaken for astronomical purposes.

Testing of Optical Systems.

The testing of optical systems has been done largely for the different departments of the Government. These tests embrace the various types of optical instruments, including microscope objectives, refractometers, photographic lenses, telescopes of all kinds, binoculars, and various minor optical instruments. Considerable improvement in the optical quality of instruments has been noticed since this testing has been carried on. For example, the magnification was frequently found to be marked wrongly by at least 15 per cent, while at present the error rarely exceeds 3 per cent. Other points have been improved, especially where the defects were not easily apparent in ordinary use, such as light gathering and definition.

Considerable time has been devoted to consultation work with the various bureaus of the Government, as well as the different divisions of this Bureau, in reference to the design, specification, testing, and use of optical instruments.

Refractive Index.

Refractive index determinations are used frequently in place of chemical analysis when a mixture is known to be composed of two compounds, but their ratios are unknown; also as a test of purity where additions of adulterants produce a decided variation. In order to rapidly determine these refractive indices, refractometers are used, and these must be calibrated and should be checked at intervals. For this purpose an investigation is in progress for the purpose of ascertaining the permanence of certain oils which may prove satisfactory for standard refractive indices. These oils were accurately determined after special aeration and carefully bottled. Another determination will be made at the end of about 12 months.

Attempts have been made to prepare standard samples of glass which are required for the calibration of other types of refractometers. The difficulty lies in obtaining glass sufficiently homogeneous, two samples taken from the ends of a bar of the best glass only 8 centimeters long differed by 12 units in the fifth place.

A preliminary study has been made of the best methods of determining refractive indices from the viewpoint of both accuracy and rapidity as well as the value of these determinations in the arts and sciences.

Testing of Materials for Refractive Index.

Six samples of standard turpentine and two samples of Chinese wood oil were secured from the American Society for Testing Materials, and the refractive indices of these samples were determined at 15°, 25°, and 35° C., as well as the specific refractions. This work was done in conjunction with the general investigation carried out by the other divisions.

Tests have been made of the refractive indices of solids and liquids, change of the index of refraction due to changes in temperature, strains in optical glass, and other tests of minor importance.

Radiometry.

Measurements of the energy transmitted by radiations, of which light and radiant heat are types, enter into many scientific investigations, both as to the nature of such energy and as to the properties of materials. They are of great importance, not only in physics and chemistry, but also in physiological investigations. During the past two years investigations have been pursued with a view to obtaining uniformity in radiometric measurement. The Bureau has developed instruments, methods, and standards of radiometry which are giving a new impetus to investigations in this complicated field of research and measurement.

Numerous instruments for measuring radiation (thermopiles) have been designed to meet various requirements; for example, one was designed suitable for delicate physiological investigation in nerve and muscle reaction. A new vacuum radiometer was designed suitable for the measurement of the radiant energy from stars. This involved the development of a convenient method of maintaining the thermoelement in a vacuum. This was done by means of metallic calcium which rapidly absorbs the air contained in the radiometer, thus avoiding the use of the ordinary heavy air-pump equipment.

Nocturnal radiation is usually a loss of heat from terrestrial substances into space. A radiometer was designed for the United States Weather Bureau for investigating this nocturnal radiation. A paper has been prepared on the latest developments in instruments and methods of radiometry. In it are given various improved modifications of the bismuth-silver thermopile which have been developed in this Bureau.

Standards of Radiation.

The Bureau has established standards of radiation in the form of incandescent lamps. In these standards the intensity of the radiant energy per unit area at a unit distance from the lamp, has been established in absolute value, first, by comparison with a black body in which the coefficient of radiation was assumed, and second, by direct determination of the intensity of the radiant energy in absolute value. The two methods gave values which are in agreement within 0.5 per cent. Hence, the standard of radiation as defined by these incandescent lamps may be considered well established. That they will supply a long-felt need is evidenced by the fact that copies were at once ordered by experimenters in this country and abroad.

Measurements were also made on subsidiary standards, including the Hefner lamp and the sperm candle. The results are embodied in a short paper submitted for publication.

Stefan-Boltzmann Constant.

Considerable progress was made in the work on the coefficient of total radiation commonly called the Stefan-Boltzmann constant.

With the instrument used in establishing the above-mentioned radiation standard, measurements were made on the total radiation

from a uniformly heated inclosure, or so-called black body. The value obtained for this constant ($\sigma=5.6 \times 10^{-12}$ watt cm⁻² deg⁻⁴) is in excellent agreement with previous determinations by other methods.

Absorption Constants of Quartz.

During the year an investigation was completed on the absorption constants of thick cylinders of quartz. The data are to be used in furthering the work on the constant of spectral radiation of a black body. The results are embodied in a paper now in press.

Radiometric Testing.

There is but little of the so-called routine testing in radiometry. The tests that do arise usually require a very considerable amount of original research. Several such tests were completed during the past year. One was concerned with incandescent lamps giving a standard spectral energy curve in the visible spectrum; another involved the question of the quality of the radiation from a straight and a spiralled filament of tungsten in a nitrogen-filled lamp; also, the determination of the spectral energy curve of this type of lamp in the visible part of the spectrum, when the lamp is under normal operation.

In conclusion, it may not be out of place to call attention to the desirability of pursuing scientific investigations, even though at the time they may not appear to have a direct commercial application. For scientific purposes the Bureau made an investigation to find a substance which completely absorbs all the infra-red or heat rays (which amounts to about 95 per cent of the radiations from the electric arc lamp) and at the same time transmit a maximum amount of the light. It was not anticipated that such data might be useful in safeguarding life and property in the most common present-day form of amusement and entertainment. In reply to an inquiry by a manufacturer for an absorption screen to protect the moving-picture film from the intense heat of the projecting lamp, this Bureau was in a position to give intelligent advice in this matter, based upon first-hand information which, at the time it was obtained, did not appear to have any special commercial application. Many such illustrations might be given.

5. CHEMISTRY.

Standard Analyzed Samples.

There is a growing tendency in commercial and Government circles to base purchases of material on chemical analysis. Analytical operations are, however, all affected by errors, due to a variety of causes, which the utmost skill and care on the part of the operator can not altogether eliminate. By the use of certain of the Bureau's accurately analyzed standard samples, analysts may check both the correctness of the methods used by them and their skill as analysts, and, on the other hand, employers may obtain information on the character of the work done by their employees. Instructors and students in educational institutions also need aids of this kind, for otherwise neither can obtain any clear idea of the skill imparted and

acquired. Certain other samples serve as standards for the preparation of volumetric solutions or as reference standards for checking calorimetric tests of fuels and other combustible substances. The first cost of materials is often large and their preparation and analysis or purification involve much additional expense. As stock becomes depleted, it must be renewed.

However conscientiously such materials might be prepared by private concerns, the public would not place in them the confidence that is accorded to samples issued by the Bureau of Standards. The Bureau distributes these samples at approximate cost. During the past fiscal year 1,629 were called for.

A special appropriation is needed to enable the Bureau to maintain on a permanent and independent basis its series of standard samples of determined composition or high purity. Of such samples the Bureau now issues 38, and the number will increase greatly in consequence of an incessant and enlarging demand.

Determination of Carbon in Steel.

An investigation has been completed and the results published of the sources of difficulty and error in carrying out the barium carbonate titration method of determining the carbon content in steel with means for obviating these. (See Technologic Paper No. 33.)

In addition to the completed work noted above, with reference to the determination of carbon in steels, many experiments have been made to ascertain whether or not higher results for carbon are obtained by burning at temperatures much above the ordinary. Many steels do yield more carbon by a single burning at the high temperature (1,500–1,100° C.) than by a single burning at those commonly employed (1,000–1,100). The amount is always small, but of moment when an exact determination is wanted, as with the standard samples issued by the Bureau. This work has involved the designing and construction of special furnaces.

Standard Methods for the Analysis of Steel.

A committee of the American Society for Testing Materials has drafted a report of methods for the analysis of steel to be used in checking deliveries on specifications. The chairman of that committee submitted the results to the Bureau for criticism and suggestions. Considerable time was devoted to the subject, more with reference to form and uniformity of statement than to the methods themselves.

Preparation of Electrolytic Iron.

The preparation of pure electrolytic iron and of alloys of iron and carbon has been actively prosecuted throughout the year in cooperation with the division of metallurgy. A large amount of iron of satisfactory purity and several iron-carbon alloys have been prepared. Related to one phase of this problem is that of a suitable material in which to cast ingots for scientific purposes. All commercial articles tried introduced into the metal some foreign material at the high temperatures that have to be employed. Thus far magnesia specially purified has been found most suitable. In order to free it sufficiently from silica the best commercial magnesite is purified.

Influence of Gases, Oxides, and Slag on the Quality of Steel.

A most important line of research on gases, oxides, and slag in iron and steel will be taken up as soon as a suitable chemist can be found. The chemical side of this problem covers methods of analysis, but it is hoped also to make a study of the influence of gases and oxides on the physical properties of steels containing them in known amounts. This presupposes exact methods of analysis.

The determination of oxygen in steel by the Ledebur method has come into special prominence of late in connection with analysis of ingot iron. The Bureau has been urged more than once to act as umpire in fixing the content of oxygen by the method named. This it has refused to do until enough experience has been acquired to justify it in certifying to the correctness of results.

Other Investigations with Reference to Iron and Steel.

Other subjects under investigation are: The investigation of the influence of segregation on the shape and size of the test ingot used for ladle analysis at steel works; the specification and investigation of metals to be used by the United States Reclamation Service for pipes and flumes on irrigation projects in conjunction with engineers of the Reclamation Service.

Cooperation on Specifications for and Analysis of Nonferrous Metals and Alloys.

Two conferences within the year have been held at the Bureau with representatives of important scientific and technical societies to arrange for cooperation of the Bureau and committees of the several societies on the subject named above. In pursuance of a desire to avoid duplication of work by the several societies which have committees dealing with the same materials, the Institute of Metals will prepare materials for cooperative test, the American Society for Testing Materials the specifications, and the American Chemical Society will study and report methods of analysis. The Bureau will lend its aid by cooperation with the above societies in whatever direction it may be needed. A beginning has been made by taking up methods for the analysis of white metals, on a very satisfactory sample furnished by the National Lead Co.

International Cooperation on Methods of Analysis for Pig and Cast Iron.

At the request of the secretary of the American Society for Testing Materials, the Bureau has become represented on a subcommittee of the International Association for Testing Materials. To this subcommittee questions of a chemical nature relating to pig and cast iron are to be referred. The first problem before it is that of coming to agreement on the methods of sampling and analysis that shall be used for export shipments. Methods were prepared by the Bureau's representative and submitted for consideration to the members of the American committee and approved for the most part. The proposals will be sent to the British and the German representatives for consideration. The chairman of the American committee of the international association is very hopeful that these proposals will lead to a marked improvement in the existing situation as to sampling

and analyzing iron that passes from one country to another. It is desired that final agreement shall be reached so that presentation of the report can be made in 1915 at the next meeting of the International Association for Testing Materials.

Phosphate Rock Analysis and the Determination of Alumina.

A study of the analytical problems in the analysis of phosphate rock has been much interrupted by other work of pressing importance; nevertheless, progress has been made and one phase of the problem, i. e., the determination of iron, has been very satisfactorily elucidated.

Determination of Water in Standard Materials and in Coal.

Work has been done on a method for the determination of minute amounts of water in organic solids, with special application to some of the standard materials issued by the Bureau, and the study of certain methods for the determination of water in coal.

New Method for the Determination of Rubber.

This method, developed at the Bureau, consists in forming an insoluble nitrosite of rubber by the action of nitrogen trioxide gas upon a finely ground, acetone-extracted sample of the rubber suspended in chloroform. The nitrosite is filtered out, dissolved in acetone, and an aliquot portion of the acetone extract is concentrated and then distributed over alundum in a porcelain boat, using ethyl acetate to complete the transfer. After expulsion of all acetone and ethyl acetate, the residue is burned in a combustion apparatus and the resultant carbon dioxide absorbed and weighed. From the carbon found the rubber is calculated upon the assumption that the nitrosite burned contains all the carbon of the rubber. Details of the combustion apparatus and operation are given. Results on samples of known composition show the method to be fairly accurate for raw rubber and high-grade vulcanized products. (See Technologic Paper No. 35.)

The general study of methods of rubber analysis has been continued in cooperation with various committees on rubber analysis and rubber specifications, and some of the results have appeared in print.

Iodine Number of Linseed and Petroleum Oils.

The iodine value of an oil is the percentage of iodine which a unit volume of the oil will absorb. This number indicates the adulteration and may be used to determine the extent of oxidation or thickening. The iodine number has numerous very important incidental applications.

The factors known to influence the iodine number are the temperature, the time of absorption, the weight of oil taken, and the excess of iodine present obtained by increasing the amount of iodine solution. The exact effect of each factor was studied by varying one at a time.

The iodine values of raw, boiled, and burnt linseed oils, and petroleum oils, were determined by the Hanus method, varying widely the amounts of oil and iodine used, and the time of absorption. It was

shown that in order to obtain reproducible results, a prescribed procedure must be followed, and conditions stated more definitely.

Lubricating Oils.

In February a conference of lubricating-oil consumers and producers was held at the Bureau to consider questions of common interest, especially the matter of formulating suitable specifications that can be checked up by physical or chemical test. Nothing positive as to specification resulted from this conference, but several valuable suggestions were made and the initial steps were taken toward placing the specification of oil on a scientific basis. An oil engineer will be appointed during the coming year, one of whose duties shall be to look into all complaints of poor service of oils delivered under Governmental contracts in Washington, to ascertain, if possible, the reasons for poor service, whether attributable to the oil itself, or to its incorrect application, and to suggest remedial measures. It is felt that a close observation of the use of lubricating oil under different service condition in connection with laboratory investigations will lead to definite specifications and reliable tests.

Chemical Researches on Paper.

A comparison is being made of the methods of determining rosin sizing in paper, in order to devise an improved method. That used at present takes no account of nonresinous material soluble in the extraction mixture. Paper pulps and the changes which occur in ground wood pulp are being investigated with a view to ascertaining their effect on the quality of paper.

A study has been made in conjunction with the paper section of two commercial caseins, and particularly the applicability of buttermilk caseins to coated papers. This investigation was made at the request of the Agricultural Department.

Analysis of Printing Inks.

A procedure of analysis of some of the common printing inks has been adopted and is given (Technologic Paper No. 39). This is the result of the experience of the Bureau in the analysis of inks for the Government Printing Office during the past five years. It is claimed that the procedure is sufficiently accurate to determine the approximate composition of printing inks.

Hydrogen Electrode Studies.

A study is being made of the changes in acidity (hydrogen ion concentration) taking place in solutions during the course of precipitations as carried out in chemical analysis. This work is closely related to that mentioned just above, but its application reaches far beyond the specific case of phosphate rock, since it will result in placing some of the operations of chemical analysis on a scientific instead of a purely empirical basis.

Operation and Regulation of Electrotyping Baths.

The Bureau was requested by the Government Printing Office to remedy unsatisfactory working of their copper electrotyping baths.

From inquiries instituted at the Printing Office and elsewhere the need for a systematic study of the best operating conditions and the control of electrotyping baths became evident. The work done thus far has been mostly in connection with the copper baths at the Government Printing Office. Nickel baths have also been studied to some extent. This work will be continued through the coming year. In the end it will benefit not only the Government Printing Office but the whole electrotyping industry.

Physicochemical Researches on Organic Solvents.

The Bureau has in progress a number of these investigations such as the density of anhydrous ethyl alcohol obtained from different sources; the refractive indices of methyl and ethyl alcohols, their mixtures with water and each other; the density and thermal expansion of acetic acid and its mixtures with water; similarity of acetone water and glycerine water.

Other Physicochemical Researches.

Other investigations now in progress are the absolute measurement of electrolytic resistance, the mercury-cadmium cell, the critical solution temperature and its use in the determination of moisture. The latter method has been applied in the determination of the solubility of water in hydrocarbons—and equilibria in the system ammonium oxalate—oxalic acid water.

The Determination of Ammonia in Illuminating Gas.

Four common forms of apparatus and a new form designed on the principle of the Cumming wash bottle were tested. The results show that the amount of ammonia in a gas can be determined with sufficient accuracy for official or commercial testing with any of the five forms. Tests were made on different indicators and their suitability for this determination pointed out. The choice of indicator was found to be of more importance than the form of apparatus chosen. (See Technologic Paper No. 34.)

Pure Ammonia for Refrigeration Constants.

The Bureau is preparing pure ammonia and other materials used or susceptible of use (sulphur dioxide, methyl chloride, etc.) in refrigeration, with a view to the determination of their physical constants. It is also studying the nature and causes of formation of a noncondensable gas in ammonia-refrigeration systems.

Study of Gas-Testing Methods.

An investigation is in progress as to the methods for determining impurities in commercial gas, especially the methods used in municipal or State inspection work, with the object of standardizing the gas-laboratory practice of this country. A part of this research has been completed and the results have been published, covering the determination of total sulphur and of ammonia. Methods of detecting hydrogen sulphide in gas have been studied to some extent, but the work is not completed. The detection of other impurities has not yet been undertaken.

A more exhaustive study, which will extend over several years, will cover the methods and apparatus for exact and commercial gas

analysis. This study will, however, probably be preceded by the preparation of the constituents of commercial gas in a pure state. The primary object of this preparation is to determine the physical and chemical properties, especially the heats of combustion of the several pure gases, but the gases will serve also for making up mixtures of known composition on which to test methods of analysis.

A Simple Gasoline Generator for Sulphur Determination.

The generator is a simple device for saturating a current of air with gasoline vapor. The mixture of air and vapor burns readily and the flame which contains practically no sulphur is used to heat crucibles where the use of an ordinary gas flame might cause the introduction of sulphur, which is found to a considerable extent in illuminating gas. It is especially useful in determining the sulphur content of a substance.

Preparation of Secondary Butter-Color Standards.

In connection with color analysis and color standards the chemistry division developed several combinations of vaseline, wax, and paraffin which when colored were found suitable for the use of butter inspectors. It was necessary that the samples have a slightly higher melting point than butter, that they resemble butter, and that they be easily tinted to butter color.

Research on the Methods and Standards Employed in Volumetric Analysis.

Of fundamental importance for exact work in almost all lines of chemical analysis is a study of the methods and standards employed in volumetric analysis. A comprehensive scheme for such a research has been formulated and submitted for criticism and suggestion to about 150 of the most experienced chemists in this country. From the replies received it is evident that the need for such a research is widely felt and its appropriateness as a Bureau problem is admitted, although opinions differ somewhat as to what phases of the large problem should be first attacked and also as to the degree of accuracy that should be striven for.

In view of the above it is hoped that this research can be undertaken in the near future to begin with the study of acidimetry and the necessarily belated subject of indicators, and be carried out with a view to the highest practicable accuracy. However, considerable additional force and equipment will be needed before this important work can be begun.

Platinum Investigation.

It is felt that the Bureau can do much for scientific and industrial users of platinum metals and their alloys with one another. The information available is meager and manufacturers of such ware are either unable or unwilling to add to it. The work can be undertaken, however, only if a reasonably large supply of material is at hand and ample funds are available for a term of years.

The project involves the preparation of each of the platinum metals in a pure state, the study of some of their properties as metals and those of the alloys that result from their combination in varying proportions.

It is suggested that the Treasury Department might be willing to turn over to this Bureau the platinum that is saved in the refining of bullion. The cutting off of supplies of platinum from Russia renders this very desirable. Provision should be made for turning over of the crude platinum by the Bureau to makers of ware in this country for conversion into laboratory utensils as needed by the different laboratories of the Government.

Quality of Chemical Reagents.

The quality of chemical reagents on the market, especially those of high price and supposedly high purity, leaves much to be desired. It has become the practice of some of the best known dealers here and abroad to attach to the bottles carrying reagents a label setting forth the nature and amounts of the impurities in the reagents, or stating that the impurities named are not in excess of indicated percentages.

The validity of such statements depends on the accuracy and comprehensiveness with which the chemical tests that serve as a basis are made. If the statements are defective, their publication is more dangerous than the omission of all indication of the degree of purity, because of the false sense of security given the purchaser.

It has been found at the Bureau, and by many individuals elsewhere, that in very many instances the labels do not state the truth as to the contaminants mentioned on the labels and also that impurities present are not indicated. The average chemist has not the time to test his reagents accurately and in detail, even if he knows what methods to apply. It seems, therefore, that some definite and radical action should be taken to relieve the situation. A committee of the American Chemical Society endeavored some years ago, to take the quality of analytical reagents in hand, but for various reasons was unable to accomplish anything of consequence. It seems as if results of value can be secured only by the intervention of some authoritative institution, like the Bureau of Standards, in whose statement the chemical public could and would have confidence. Just what form such intervention should take is not yet clear, but possibly by controlling at the manufacturing establishments, of the bottling and sealing of each separate batch of materials, reserving a truly representative sample for analysis at the Bureau, followed by release for sale of the sealed bottles after attaching to them the test results. An alternative plan for very special reagents might be for the Bureau to purchase material at wholesale prices and to assume all the duties of bottling and sale, as it does not with most of its standards for analysis.

Either of these procedures, particularly the latter, would beyond doubt meet with the hearty approval of chemists everywhere, but would involve the creation within the chemical division of a special section, the maintenance of which would involve a considerable expenditure for salaries and purchase of materials. This expense would, however, be covered by the fees charged for inspection and analysis in the one case and derived from sales in the other.

A special function of such a section of the chemical division would be to determine the most accurate methods (with their limitations) for testing reagents and to give to these methods the widest publicity.

Oxidimetry.

It is suggested that active steps be taken to complete work already begun upon the uses of permanganate solutions in oxidimetry and especially with reference to the determination of iron. This work should be done under the direction of the associate chemists engaged in the acidimetry problem. If such plan can be actively carried out, it is believed that substantial progress can be made in the course of a few years. In the interval, up to such time as an adequate force is available, a study of the literature (a large task in itself), can be made and the details of the work planned. It is thought that the cost of apparatus and materials will not be very great.

Additional Chemical Assistance.

Attention is directed to the urgent necessity for the immediate increase of the chemical staff of the Bureau, which is at present almost entirely engaged upon the chemical work for the Bureau and the testing of materials for the Government service. The present force is entirely inadequate for these purposes. In addition the Bureau should be in a position to undertake more investigations for the purpose of determining the underlying chemical principles involved in all branches of standardization.

Chemical Tests of Materials.

More than 9,500 chemical tests of materials were made, classified by character of materials as follows: Irons and steels, 1,016; coated metals, 392; nonferrous metals and alloys, 670; materials from electrotyping baths, 250; cement materials, 958; asphalt and coal tars, 385; roofing felts, 210; linseed oils, 420; oil driers, 345; paints and paint materials, 1,022; varnishes, 400; lubricating oils, 127; greases, 14; rubber, 504; rope, 34; paper, 2,138; printing inks, 22; writing inks, 5; sealing wax, 44; molding wax, 4; flax packing, 46; asbestos, 67; roller composition, 7; wools, 85; soap and soap products, 6; glue, 5; miscellaneous, 678.

A point of interest is that the testing done for private parties is, as for last year, only about 1.5 per cent of the total. A total of 1,629 standard analyzed samples have been distributed for standardizing chemical analytical operations as follows: Samples of irons and steels, 1,300; samples of brass, 57; samples of ores, 183; samples of sodium oxalate, 89.

The Bureau's chemical tests were made for about 50 Government bureaus and establishments, including practically every executive department, as follows: Agriculture, 4; Commerce, 690; Interior, 44; Navy, 133; Post Office, 65; State, 16; Treasury, 3,864; War, 2,406; United States committees and commissions, 258; Indian establishment, 2,153; State and municipal institutions, 38; miscellaneous institutions, 10; private parties, 139.

General Paint Investigation.

Active cooperation with one of the technical societies (American Society for Testing Materials) has been in progress for several years to determine the relative value of various types of paint, both for wooden surfaces and for the protection of iron and steel.

An extensive test of white paints for wooden surface was started in August, 1912, in the vicinity of Washington. After about two years' exposure this shows that the single pigments, basic carbonate white lead, basic sulphate white lead, and zinc oxide are not in such good condition as a mixture of these pigments, and the indications are that an addition of a certain quantity of extenders, such as barium sulphate, silica, china clay, asbestine, etc., to a mixture of white lead and white zinc is an advantage.

From tests which have been conducted on steel plates painted with some 12 standard pigments and exposed to the intermittent action of water and air, commercial red lead was found to give satisfactory protection.

It is intended to confirm these general results by additional tests of those pigments which seem to warrant further investigation.

Analysis of Oil Varnish.

Considerable work has been done on investigation of methods of analysis of oil varnishes, and while progress has been made the methods which have yielded promising results are very long and tedious, and publication has been deferred pending experiments which it is hoped will yield more rapid and equally accurate results.

Corrosion of Iron and Steel.

Though much study and many tests have been made in an effort to determine what type of metal is most resistant to corrosion, the results so far obtained are conflicting, and the user of the material is at a loss how to specify the most resistant metal.

The bureau is taking an active part in planning an extended series of service tests in cooperation with a committee of the American Society for Testing Materials, composed of manufacturers and consumers of the types of ferrous metals in commercial use, which it is believed will furnish valuable information. In addition to this series of tests it is the intention to conduct an independent set of tests on similar types of metal, entirely under the control of the bureau, as so many factors enter into this problem that no one set of results can be considered conclusive.

6. METALLURGY.

The Critical Temperatures A2 and A3 of Pure Iron.

An important scientific investigation of fundamental interest in defining the properties of iron and steel, completed last fall, is the determination of the critical temperatures A2 and A3 of pure iron. The existence and nature of the lower transformation, A2, had been in dispute for over 25 years, and the interpretation of the properties of iron in an uncertain condition. With specially designed apparatus using pure iron from several sources, including samples made at the Bureau of a purity of 99.98 per cent and freed from gases, A2 was exactly located at 768° C., and A3 at 909° C. in heating and 898° C. on cooling. No other critical ranges were found for pure iron below 1,100° C. This investigation called forth the following action by the

American Institute of Mining Engineers at the October meeting in 1913:

Recognizing that the work being accomplished by the United States Bureau of Standards is of great value, not only to the scientific but also to the commercial interests of our country, the persons present at this meeting of the American Institute of Mining Engineers, held in New York this 17th day of October, under the auspices of the iron and steel committee of said institute, most earnestly urge upon the proper National Government committees and authorities the supreme importance of proper financial and other support to that bureau, and also request that allied and kindred American scientific and commercial organizations also act in this matter in such ways as in their judgment seem best advised.

The results of this work were also received favorably by the British Iron and Steel Institute.

Finishing Temperatures of Rails.

A matter of the greatest importance to the public is the production of sound rails. One of the questions involved in their manufacture about which there are differences of expert opinion is the temperature at which rails should be rolled. In order to determine what is the American practice and to demonstrate the practicability of accurately gauging temperatures in a steel mill, an investigation has been carried out on the finishing temperatures and properties of rails. The Bureau has had the hearty cooperation of four of the principal rolling mills of the country, their plants being placed at our disposal for this investigation. It was found that the mills roll their rails at temperatures well within the specifications, but that the latter permit finishing temperatures to be higher than those of the ingots from which the rails are rolled. This specification, which is supposed to limit rail finishing temperatures to a point slightly above the "critical range" of steel (about 670° C.), has therefore no significance. There were also determined the expansion coefficients of Bessemer and open-hearth steels, 0.0000146 and 0.0000156, respectively, per degree C. between 0 and $1,000^{\circ}$ C.; the melting ranges of rail steels, $1,470$ to $1,525^{\circ}$ C.; their critical ranges, below which it is not safe to roll rails, 650 to 680° C. on cooling; and the distribution of temperature throughout a rail section on cooling from $1,070^{\circ}$ C., showing variation of over 80° C. from center to surface.

Melting Points of the Elements.

Among the fundamental constants that enter into many physical and chemical relations of the elements are their melting points. There has been completed a determination of the melting points of the chemical elements of atomic weight 49 to 58, using in part the method of the micropyrometer which permits accurate measurements with samples as minute as 0.001 mg. The following results were obtained for melting points: Nickel $1,452^{\circ}$ C., cobalt $1,478$, iron $1,530$, manganese $1,260$, chromium $1,520$, vanadium $1,720$, titanium $1,795$. In this investigation the Bureau had the cooperation of several chemists both in the United States and abroad who furnished very pure samples of the elements they had prepared.

Total Radiation from Nickel Oxide.

The application of scientific methods to metallurgical and other technical processes carried out at high temperatures, necessitates the

introduction of methods of measuring these temperatures and requires, for this purpose oftentimes, a knowledge of the characteristic radiation or emissivity of heated substances both throughout the visible spectrum and for the total radiation. Experimental methods have been devised which are of general application and an investigation completed on the spectral and total radiation of nickel oxide in the range 600° C. to 1,300° C. The corrections to pyrometers using a single colored light and using total radiation have also been determined when sighted on heated nickel oxide. The monochromatic emissivity was found to increase linearly with increasing wave length between 0.5 and 0.7 μ and to decrease linearly with increasing temperature. The total radiation increases with temperature. The following table gives some of the results obtained:

Value of monochromatic emissivity of nickel oxide for:

| | | | | | | |
|--|-----|------|-----------|-------|-------|-----------|
| Wave length----- | 0.5 | 0.6 | 0.7 μ | | | |
| For T=1,060° C. $E\lambda$ ----- | .88 | .885 | .89 | | | |
| Temperature----- | 800 | 900 | 1,000 | 1,100 | 1,200 | 1,300° C. |
| (Wave length=0.65 μ) $E\lambda$ ----- | .96 | .93+ | .91 | .89 | .87 | .85— |
| Correction to optical pyrometer (using λ =0.65 μ) for above tem- peratures----- | +2 | +4 | +7 | +10 | +87 | +20 |

Value of total radiation for:

| | | | | | |
|--|------|------|-------|-------|-------|
| Temperature °C----- | 600 | 800 | 1,000 | 1,200 | 1,300 |
| Total radiation (E)----- | 0.54 | 0.68 | 0.76 | 0.85 | 0.87 |
| Corrections to add to radiation pyrometer----- | 110 | 95 | 75 | 55 | 45 |

Iron-Carbon Equilibrium Diagram.

The fundamental problems in the scientific metallurgy of iron and steel is the establishment of the "iron-carbon equilibrium diagram" which gives the temperatures at which transformations take place in iron and steel. This has been studied by numerous investigators, but there are still many outstanding discrepancies and uncertainties due to several reasons, such as unreliable temperature scales and inaccurate methods of measuring temperatures, impurities both solid and gaseous in the samples experimented upon, uncorrected factors such as rates of heating and cooling, etc.

An experimental investigation of the iron-carbon system by thermal methods is well under way, making use of the methods and apparatus for determining the critical ranges of pure iron. It is hoped to finish this work the coming year for the temperature range 0° to 1,100° C. for all possible compositions of the iron-carbon alloys and using only strictly pure materials.

Besides its purely scientific interest, the interpretation of the iron-carbon diagram affords a basis for the rational heat treatment of steels, a question of the utmost practical importance.

It is planned to study in detail the exact effect on the iron-carbon equilibrium of the addition of other elements such as manganese, silicon, etc., using alloys of exactly controlled composition.

Preparation of Pure Metals and Alloys.

The preparation of strictly pure metals and alloys is absolutely essential as a basis for providing suitable materials for the scientific study of the properties of such metals and alloys, and often these very pure standard materials are not readily obtainable and sometimes

not available at all. The Bureau therefore has begun the preparation of certain pure metals and alloys. The purest iron yet obtained was prepared at the Bureau by an electrolytic method and then melting in vacuo; this iron has been used in the determination of the critical ranges of pure iron by thermal analysis and by electrical resistance and as the basal material for making up a very complete series of the pure iron-carbon alloys. The preparation of irons, steels, nickel and other pure metals and alloys of the iron group will be continued on a more extended scale and with the endeavor to produce larger pure samples than has been hitherto possible, for the purpose of studying the physical properties of such pure metals and alloys.

Carbon in Steels at High Temperatures.

A more strictly chemical problem, but of very considerable metallurgical interest, is the determination of carbon in steels at high temperatures and the variation with temperature and with other constituents. A preliminary account of such an investigation giving the accuracy to be expected under certain definite conditions of experiment is in press.

Material for Crucibles.

The most troublesome factor in the preparation of pure irons and steels is the securing of suitable crucible materials which will not contaminate the metals during the melting process. A very small amount of silicon, for example, present in a magnesia crucible will contaminate iron and its alloys, thus vitiating the purity sought. A thorough investigation of the methods of preparing inert crucibles free from such impurities is being carried out and satisfactory small magnesia crucibles have been made. New methods have been devised and are being tested for purifying magnesia on a scale suitable for crucibles for the melting of larger samples, and other refractory materials are also being experimented with.

Physical Properties of Pure Iron.

The study of the physical properties and allotropy of pure iron is being continued by an investigation, about completed, on the electrical resistance and critical ranges of pure iron from 0° to 950° C. It is shown that there are no anomalies or transformations in iron below 757° C. (=A₂) the temperature at which the electrical resistance shows a reversible inflexion, i. e., the same on heating as on cooling. At the upper critical range (A₃) there is a transformation beginning at 894° C. on heating and cooling and extending over 25° C. in each case, accompanied on heating by an actual decrease of resistance on cooling through A₃. A precision of 1 in 1,000,000 was attained in the measurements of the iron resistance, and a new cooling-curve method was used. This work will be extended to the iron carbon and other iron alloys and it is also planned to investigate the thermoelectric behavior of iron and its alloys over the same temperature range. This work with that on the thermal behavior, will then form a rational experimental basis for an adequate theory of the allotropy of iron and for the explanation of the iron-carbon diagram as based on the variation in the several physical properties.

Standard Test Specimens.

The American Institute of Metals has been desirous of obtaining authoritative data on the best forms and methods of preparing standard test specimens of nonferrous alloys and particularly of the more ordinary bronzes and brasses. The Bureau, with their cooperation, has been carrying out an experimental investigation on standard test specimens of the zinc bronze: 2 zinc, 10 tin, 88 copper. The effect on the physical properties of pouring temperatures and methods of molding and casting have been studied as well as of the best shape of test pieces and of heat treatment such as annealing and quenching together with microscopic examination of the structure of the metal and determination of its transformation temperature. This investigation is to be extended to other bronzes and brasses as facilities permit.

Causes of Failure of Railway Material.

The Bureau is charged with the investigation of the causes of failure of railway material. The prevalence of such failures and their disastrous consequences need no comment. As a preliminary to this investigation, with the cooperation of the Department of State there has been secured considerable information concerning European regulations and specifications regarding the manufacture and use of railway material and statistics of railway accidents and failures. Numerous conferences have been held with representatives of railroads, manufacturers of railway material and representatives of technical societies responsible for specifications, with a view to planning this investigation to best serve the public, and various manufacturing plants have been visited. These have offered all possible facilities for aiding in this work.

In addition to the investigation completed on finishing temperatures and properties of rails, a beginning has also been made on an experimental study of what has recently become one of the most serious and puzzling causes of failure of rails, known as transverse fissures. The Bureau has been asked for help in this matter by the Public Service Commission of New York State, has already the active cooperation of one of the large railway systems, and the offer of cooperation from one of the rail mills. The Bureau will undoubtedly be aided by all interested parties. The investigation of failed rails which have caused accidents and submitted by the Interstate Commerce Commission for examination, has recently been put on a systematic basis by the addition of special equipment and the arrangement for a more efficient cooperation of the several divisions of the Bureau interested.

The various factors entering into the processes of manufacture of and specifications for rails should be taken up, such, for example, as determining the effects of rolling rails of different kinds hot and cold. This will require the active cooperation of rail mills and railways. Through the generosity of Sir Robert Hadfield, who placed nine ingots made by various processes including his own at our disposal, it has been possible to commence a far-reaching study of sound ingots and rails.

It is planned to make a thorough study of the metallurgical, chemical, and mechanical problems of car wheels including specifications,

tests, foundry practice and of the different classes of service on railways.

Fusible Boiler Plugs.

A fusible boiler plug which had failed to operate, causing a boiler explosion and loss of life, was submitted for test by the Steamboat-Inspection Service. The tin plug was found to be converted mostly into oxide. A systematic investigation of fusible boiler plugs has been begun including an examination of new plugs for fulfillment of specifications, and of used plugs to determine their deterioration. Experiments are also being made on the production of tin oxide from tin in presence of steam which already indicate that the oxidization of the tin can be greatly accelerated. The durability of fusible tin plugs would therefore appear to be a serious question. This investigation is of considerable extent, involving the examination of the properties of several hundred plugs.

Failure of Manganese Bronze.

Another type of failure of nonferrous metals has been brought to the attention of the Bureau by the board of water supply of the city of New York, namely, the failures of "manganese bronze" and other brasses used in the construction of the Catskill aqueduct. These serious failures appear to be due to faulty methods of manufacture and the Bureau is beginning an experimental investigation of these metals in the light of the above experience with a view to determining the procedure necessary to prevent such failures and for the purpose of developing adequate testing methods to detect faulty metals of this class.

Thermoelectric Method of Determining the Impurities in Platinum.

In exact chemical combustions in which platinum crucibles are used there is loss of weight of the crucible which limits the accuracy of these operations. It appeared to the American Chemical Society highly desirable to make exact measurements of the loss in weight of various grades of platinum ware on heating and to determine the composition with least loss. An extended series of such experiments are being carried out particularly with reference to the effect of iridium and iron as impurities on loss of weight. A thermoelectric method of determining the impurities in platinum in terms of iridium has been developed which permits accurate certification of the platinum content without destroying or even defacing the objects tested. This method of detecting platinum purity has already been of service to several Government bureaus, institutions, and firms in the selection of platinum utensils and will probably become of general application. Many persons interested have taken the opportunity offered by the Bureau to have the purity of their platinum ware tested here by the thermoelectric method. Some experiments with crucibles containing rhodium show this metal to be preferable to crucibles containing iridium or even to pure platinum crucibles.

Nomenclature of Alloys.

Attention has recently been directed to the unsatisfactory status of the nomenclature of alloys. This question has been taken up by

the Bureau in connection with committees of the American technical societies interested and with the International Journal of Metallography. There are prospects of obtaining a very considerable improvement in a most desired uniformity of usage in the naming of metallic alloys.

Measurements with the Micropyrometer.

Measurements with the micropyrometer are being carried out on several problems. This instrument permits the measurement of temperature of microscopic particles (0.001 mg.) to 3,000° C. and there is in preparation a series of determinations of the melting points of some 15 of the refractory chemical elements. Most of these can be obtained pure only in minute quantities and the method of the micropyrometer is the only one available for the determination of this important constant for some of these elements. We have here the cooperation of many chemists who have supplied samples of pure chemical elements.

It has also been possible to apply the micropyrometer to the measurement of the monochromatic emissivity of microscopic samples. This constant has been determined for some 20 elements. It is expected to determine the melting points and emissivities of all the available refractory elements and of numerous oxides. The melting points of several hundred commercial steels are also being determined by this method.

Method of Sampling Steel.

A matter in which there has been lack of uniformity of practice in steel works is the method of sampling the method for analysis. In cooperation with a committee of the American Society for Testing Materials the Bureau has taken the preliminary steps in an investigation of test ingots including a study of the segregation of the chemical elements as determined chemically and microscopically in terms of size and shape of the ingot with the object of determining the best size and shape of the ingot and method of taking the sample. This work should be followed by an experimental comparison between ingot analyses and those of the finished product, as in many instances, very embarrassing anomalies have been found. It is probable that for some products, such as rails, it will be found advisable to specify the analysis of the finished product rather than of a sample ladled out of the liquid metal before casting.

Efficiency of Surface Combustion Furnace.

There is also under way an investigation of the efficiency of a surface combustion furnace. This is a new type of gas furnace which gives very high temperatures with less fuel than the usual forms.

Metallurgical Testing.

The following metallurgical tests were completed: There were submitted 198 samples for test involving heat treatment and thermal analysis, of which 4 were of nonferrous metals and 194 of iron and steel; 126 samples were submitted for metallographic testing, of which 4 involved rail failures, 70 were for identification of metals or process of manufacture, 13 involved metal failures, and 39 samples were for miscellaneous metallographic testing; and 22

samples were submitted involving miscellaneous metallurgical testing.

Of these 346 test items, 201 were for 12 different establishments of the Government and 45 for the public, or 82 per cent of testing was for the Government. The Government tests were distributed among the following: Springfield Armory, Geological Survey, Interstate Commerce Commission, Isthmian Canal Commission, Bureau of Standards, Secretary of Commerce, Bureau of Navigation, Post Office Department, District of Columbia, Quartermaster Department, Public Printer, and the Steamboat-Inspection Service.

Several of the above tests were of an elaborate nature requiring extended experimental investigation and some of them required as well thorough bibliographic studies. There has also been heavy correspondence on specifications for and properties of metals.

Metallurgical Information.

Requests for information on the metallurgical properties of metals and alloys have come from most varied sources, including Government bureaus, electrical companies, railroads, technical societies, universities, students, jewelers, inventors, metal manufacturers of all kinds, patent attorneys, consulting engineers, State governments, public-service commissions, city governments, automobile manufacturers, etc.

From the many letters received on the subject there appears to be a general demand for United States standard specifications and definitions of metals and alloys of all kinds, and surprise is sometimes expressed that the Bureau of Standards has not a complete file of such specifications.

The requests, verbal and written, for information concerning properties of metals cover almost every conceivable aspect of the subject and the information furnished finds its way into many channels, such as preparation of specifications, improvement of manufacturing processes, products and instruments, textbooks, detection of fraud or impurities, explanation of failures, patent litigation, etc. The following are a few illustrations, many of which might be given:

Regarding contamination of nickel by salt for use as to constancy of melting point of salt in nickel crucibles for thermoelectric calibration.

What is wrought iron?

Metals which expand most and disintegrate least on heating.

Latent heat of fusion of copper, from a technical handbook author.

Several requests as to patinas of different metals, from jewelers and others.

How to prevent corrosion of iron and steel pipes, posts, etc., from several Government departments and others.

Definition of bronze and brass, etc.

Melting points of many metals, from many classes of people.

Relation of heat treatment to change in dimensions, from manufacturers of automobile parts.

How to make a copper-titanium alloy.

How to recover lead from used storage batteries, from Navy Department.

How to detect a mechanical, electrical or chemical break in copper wire, from consulting electrical engineer.

Publications.

In addition to the above questions upon which information was furnished, the Bureau issued during the year the following metal-

lurgical publications: "Metallographic testing" (Circular No. 42); "The critical ranges A2 and A3 of pure iron" (Scientific Paper No. 213); "Melting points of the refractory elements, 1—Elements of atomic weight 48 to 59" (Scientific Paper No. 205). The following publications are now in press: "Observations on finishing temperatures and properties of rails," "The determination of carbon in steel and irons by direct combustion in oxygen at high temperatures," "The emissivity of metals and oxides. I—Nickel oxide in the range 600 to 1,300."

7. STRUCTURAL, ENGINEERING, AND MISCELLANEOUS MATERIALS.

Structural Steel Column Tests.

An important investigation, now in progress, which is of great value to the engineering and architectural professions, consists of series of column tests which the Bureau is now making in cooperation with the steel-column committee of the American Society of Civil Engineers, and the steel-column committee of the American Railway Engineering Association.

The series of the American Society of Civil Engineers comprises nine different types of cross sections. Eighteen columns of each type are being tested, nine of light and nine of heavier structural shapes. The nine columns, both of the light and heavy kind, are made in these different lengths, so that there are three columns of each type and weight of section having the same length.

The American Railway Engineering Society's columns comprise 18 latticed columns provided with square bearing plates at both ends. For the present only one type of cross section, but of two different weights of structural shapes, has been used. Both the light and heavy columns are made in three different lengths, there being three columns of each length and weight of cross section.

In addition to these column investigations, a large number of steel bridge columns have been tested in cooperation with prominent engineers. The columns are facsimiles of members from long-span bridges which are being erected or soon will be erected in America. The reports on the data and results of these tests, when completed, will be very valuable to bridge designers as such data on large sized columns have not been available heretofore.

The purpose of these tests is to determine the best forms of cross section of columns and also to correct or confirm the formulas used by engineers and architects for calculating the strength of columns. Not alone are such formulas valuable for determining the loads which can safely be carried by the columns used in various structures, but they also enable the designer of columns to make the most economical use of the steel employed in their construction, i. e., to make a minimum amount of material carry a given load with safety.

The testing of these columns must be done very carefully in order to secure reliable results. About one-third of the two series of columns have been tested since the beginning of these tests last December. The work has not progressed far enough to admit of drawing any definite conclusions from the tests, and it may be necessary to considerably extend the present program of the investigation before arriving at a final interpretation of the results.

Brick and Concrete Column Tests.

The tests of a series of full-sized concrete columns have been made on the 10,000,000-pound testing machine at the Pittsburgh branch. These columns were designed and constructed under the supervision of a committee of practical engineers in order that they might represent as nearly as possible the actual conditions found in concrete work. The results of this investigation, as well as that of a similar investigation as to the strength of brick piers will be of great value to architects and construction engineers.

Failure of Rails and Railway Material.

At the request of and in cooperation with the division of safety appliances of the Interstate Commerce Commission, the Bureau has conducted investigations to determine the causes of rail and tire failures, all of which caused derailments or wrecks. Similar material is also being collected directly from the railroad companies and manufacturers of railway equipment. In each case careful chemical, microscopic and mechanical tests are made to ascertain whether the metal is of inferior quality, or whether the present day service conditions as to wheel loads are too severe or too great. The results of this investigation will contribute toward safer railroad communication.

Standard Test Specimen for Cast Bronze.

At the request of the American Institute of Metals, the Bureau has undertaken the investigations preliminary to the establishment of a standard test specimen for cast bronze. About 800 specimens have been prepared from a typical bronze consisting of 88 per cent copper, 10 per cent tin, 2 per cent zinc, and tested for ultimate strength. It is hoped that these results in conjunction with the results of the investigation of the metallurgical division will serve as a guide in the specification of a standard test specimen for such materials. (See also Metallurgical investigations.)

Influence of Time in Testing Steel Specimens.

The Bureau is cooperating with the American Society for Testing Materials in an investigation to determine the effect of the speed of application of the load on the yield point of a steel specimen in tensile tests. The yield point is the load in pounds per square inch at which a flow of the metal occurs when subjected to tension or compression. The purpose of this investigation is to ascertain the best speed of applying the load when making commercial tensile tests of various kinds of steel. The work has only recently been undertaken and no analysis of any of the results have yet been made.

Measurement of Strains in Engineering Structures by Means of the Strain Gauge.

Some time ago the Bureau began an investigation of the measurement of strains in engineering structures by means of the strain gauge. The method was employed on typical bridges, structural steel buildings, boilers, canal lock gates, and ships, for the purpose of ascertaining whether or not the method is applicable for the measurement of stresses in such structures. Considerable data in connection with these typical cases have been collected, but owing to the

recent transfer of the expert engaged in this work to the Interstate Commerce Commission, the publication of the results of this investigation has been delayed.

Wire Cables.

An extensive investigation of causes of failure of wire hoisting cables has been planned and begun, and steps are being taken toward the collection of material. This investigation is being carried on at the Pittsburgh branch, and will cover the various practical uses of these cables about which very little is known at present.

Calibration of Testing Machines.

It is desirable to test the accuracy of the reading of testing machines from time to time, especially during the course of a long investigation. With this point in view, the Bureau has secured apparatus for the testing of machines up to 50,000 pounds capacity and has undertaken the design and construction of an apparatus with which it hopes to be able to standardize its own machines as well as those of the public to a point which lies as far beyond the 50,000-pound limit as may be necessary.

Information as to the Strength of Metals and Alloys.

Much assistance has been rendered by the Bureau during the past year in the form of answers to correspondents seeking information as to the strength and other properties of metals and alloys. These inquiries were received from universities, research laboratories, individuals, corporations, and the various branches of the Government service.

The inquiries covered a wide range of subjects. Many were requests for technologic papers and other printed matter; others pertained to standard specifications and standard methods of testing and some asked for the strength of different articles such as ropes and knots, chains, wires, riveted joints, brass tubing, etc. The Bureau's opinion has been sought in regard to the accuracy of various testing apparatus; also in regard to the feasibility of various devices and structures such as concrete ties and new types of rail. Inquiries have been made concerning the kinds of testing apparatus needed for particular purposes and concerning the usefulness of new apparatus. Information as to the cause of failure of manufactured materials has been the basis of many requests.

The information given by the Bureau has been used in selecting the proper equipment for laboratories, in legal cases, in the testing of supplies, and in the design of various structures.

Tests on the Strength of Materials.

The tests of compression and tensile strength and transverse bending strength made at the Washington laboratories were for practically all departments of the Government. They included 275 iron and steel tests; such as reinforcing bars, Army-tent tripod, boiler plate, button head bolts, boiler flues, twisted type stay bolts, wire stay bolts, steel anchor bolt, a large number of cast-iron arbitration bars; 48 tests of copper, and brass and other alloys; 10 cable and rope tests; and 18 miscellaneous.

In addition, two Riehle testing machines, one of 200,000 pounds and the other of 400,000 pounds capacity, have been calibrated to 50,000 pounds, at the request of the steel company owning them.

Hydration of Portland Cement.

One of the most interesting investigations completed during the past year has been one dealing with the hydration of Portland cement. This study is of prime importance, both to the manufacturer and consumer, since if it were shown that the presence of any one constituent in Portland cement would give very desirable properties in particular cases, such as quick hardening or slow hardening, the manufacturer could so control his product that he could obtain either of the above desired properties. At the same time the consumer who might desire either of these, depending upon the conditions, would be able to secure them in the market. Furthermore, the conditions under which concrete is hardened vary to a great degree; also the medium in which the concrete is hardened varies considerably. If, therefore, in a study of hydration, the products which result under normal conditions were determined, it would be possible to anticipate what would result under abnormal conditions of hardening. This present investigation showed what the production of hydration of the constituents of Portland cement are under normal conditions, and also which of the constituents produced the early hardening and which the later hardening.

The above investigation was carried on at the Pittsburgh branch with materials produced in an electric furnace and with some commercial cements, but in no case were the actual products of hydration compared with the strengths produced. At the present time, however, this investigation is being continued with materials prepared in sufficient quantity to make specimens for physical testing, and the results so far obtained on these confirm the results obtained in the above-mentioned investigation. The burning of Portland cement in which the various constituents have been carried through wide limits, has been continued, as well as an investigation in which the effect of replacing the lime with magnesia has been studied. In the latter case cement has been burned in which no limestone has been used in the raw mix, it having been replaced entirely by dolomite. The results obtained in all the burns have been very interesting, but it has not been thought advisable to publish them until some long time tests have been completed.

Durability of Concrete in Alkali Waters.

One of the most important investigations started during the year is being conducted in cooperation with the Reclamation Service, the drainage division of the Department of Agriculture, and the Association of American Portland Cement Manufacturers to determine the durability of concrete of various kinds in concentrated alkali waters. This is, in fact, an extension of an investigation started by the Government in 1908, a report of which was published in Technologic Paper No. 12 of the Bureau. Some 8,000 specially prepared experimental drain tile were made under the Bureau's supervision and shipped to badly alkaline districts in Colorado, Montana, Wyoming, Arizona, Washington, New Mexico, Utah, where

typical alkalis having different characteristics were found, and to Missouri, Minnesota, and Iowa, for comparative purposes. These tile were installed on Government reclamation projects under expert supervision and are to be inspected and tested from year to year. The results of this investigation will be of much value to the public and the Government in irrigated districts of the West where concrete is the most available structural material and will be most economical for certain purposes if it will resist alkali disintegration. The people of the West have been somewhat skeptical concerning the permanency of concrete exposed to alkali waters owing to the failure of a number of Government and private structures in such districts.

High-Pressure Steam Test of Cement.

The investigation of the value of atmospheric and high-pressure steam tests as a means of determining the soundness of Portland cements has been continued. Results indicate that this test can not be used as a reliable guide. Many cements failing to pass this test are, under normal conditions, found to be sound and equal in cementing value to those which do pass it. This test has been exploited during the past few years by some engineers and widely discussed in the technical press. Many requests were received by the Bureau for information concerning the merits of the test and it was on this account that the investigation was started. A report giving results of tests of concretes up to two years of age made with these various cements will be published during the ensuing year.

Methods of Determining the Time of Setting of Cement.

An investigation was completed which showed the sources of error in determining the time of setting of cements by the Gillmore and Vicat needles. This was undertaken because of a controversy between the engineering societies and the Government as to the relative merits of these apparatus. Neither apparatus was found to be satisfactory and the Government's contention was supported that both methods are subject to about the same error and the simpler should be adopted as standard until a more satisfactory method can be developed. The determination of the time of setting of cements is important. If a cement sets too rapidly, it may harden before it is placed in the forms; and if it hardens too slowly, it causes added expense in handling.

Standard Cement Sieves.

The importance of standard cement-testing sieves to the industries was pertinently brought to the attention of the Bureau by the fact that one cement mill had to regrind thousands of barrels of cement, at considerable financial loss, on account of unknown variations in the standard sieves which they were using to standardize their product. An investigation of "Variations in the results of sieving with standard cement sieves" was completed during the year and published as Technologic Paper No. 29. A further investigation of the standard 200-mesh sieves was made and completed, but it has not yet been published. The results of this investigation suggest the desirability of changing the specifications for standard sieves and the necessity of ensuring to the public a standard sample for checking sieves. It shows that the uniformity of sieves should be much

improved, as the greatest variation is in the spacing of the warp wires which are fixed by the accuracy of the reeds, upon which wires are threaded when the cloth is woven.

Standard Specification for Portland Cement.

Joint meetings with representatives of other Government departments have been held with representatives of the American Society of Civil Engineers and the American Society for Testing Materials in an endeavor to obtain one United States standard specification for Portland cement. These meetings have been productive of suggested improvements to all present specifications and substantial agreement has been reached on a single specification in all but a few matters, and it is believed all differences will be adjusted before the end of the ensuing year. The work of this conference made necessary several investigations of testing methods and has suggested the inadequacy of present tests and the need of much additional work of this character. The endeavors of this conference which is fixing the standard of quality for all American Portland cements affects the entire industry and assists the engineers by furnishing them an adequate and practical specification.

Miscellaneous Investigations of Stone, Cement, etc.

The miscellaneous investigations have included the investigation of marbles considered for use in the construction of the Lincoln Memorial; of floor marbles and composition flooring materials, such as magnesite, cork, rubber, cement, etc.; of marbles for toilet rooms to determine their suitability for Government buildings; the cause of defects and failure of concrete and composition floors in Government buildings; the suitability of sands for use in concrete; the cause of defects in plaster wall; the suitability of certain available materials in reclamation projects for the production of silica cements, etc. Many of these investigations required several weeks' or months' work while others were completed within a few days. A total of 538 samples of stone and 138 samples of miscellaneous materials were tested in connection with these investigations. A very few tests of cement, concrete, and stones were made for city and State governments, commercial testing laboratories, cement manufacturers, stone quarries and the public, mostly in connection with investigations or as check tests. Samples of cement were tested for a cement manufacturer to determine the relative quality of the product from his various mills. Samples of concrete were tested for a city which suspected that a contractor had supplied inferior concrete. Samples of stone were tested for a State government and for the public to determine physical qualities.

Investigation of Building Stones.

An advisory committee, composed of representatives from the United States Geological Survey, Office of Public Roads, Bureau of Mines, and the Bureau of Standards, was organized to obtain co-operation in a comprehensive field and laboratory investigation of the stone resources of the United States. In the past each Bureau has been working in its own particular field and there was no correlation in the work. Thus, where geologic data were often available concerning structural stones, the physical qualities were not known

or the reverse condition existed. Also, there has been more or less duplication of work. A general agreement as to distribution of work, in order to avoid any duplication, was reached and a program outlined. Some new stone working equipment has been purchased for preparing samples and work will start with the beginning of the ensuing fiscal year. It is proposed that the Bureau maintain a sample file of the building stones of the United States which will be available for reference to the Government and public, together with information on the physical qualities.

Effect of Moisture and Temperature Changes on Concrete.

Work was continued on a study of the volumetric changes which take place in concrete and the behavior of concrete exposed to various moisture and temperature conditions. Special study has been made of concrete in street pavements, as the information is necessary to properly design this type of structure, and prevent subsequent cracking. The results of this investigation are of interest more particularly to the highway and general construction engineer. There are so many variables entering into this problem that it will probably require several years to obtain satisfactory results.

Granular Analysis of Cement.

The development of a granulometric analyzer was completed and studies have been made of the fineness of about 25 brands of cement. The results indicate that the quantity of active cementing material in Portland cements can be more readily determined by an apparatus of this type than by the use of sieves. A quantitative separator has also been designed which is capable of selecting the particles of various sizes and will permit of a study being made of the value of fine grinding of Portland cements and its effect on quality. The results of this investigation will be of particular value to such Government offices as the Reclamation Service, and is of much general interest to the manufacturer and consumer of cement. If it is found that only the "flour," which comprises about 35 per cent of the cement, is appreciably active, considerable saving could be made by separating this material at the point of manufacture and not paying freight on a very large quantity of relatively inert material.

Durability of Plasters and Stuccos.

An advisory committee, consisting of representatives from the Government, engineering societies, the Lime Manufacturers Association, Cement Manufacturers Association, Gypsum Industries Association, and Metal Lath Industries Association, was organized to assist in a comprehensive investigation of the durability of stuccos and plasters. A preliminary investigation was started by the Bureau two years ago and the present program is an extension of that work. The work is just inaugurated and no results are yet obtainable. The investigation was deemed necessary on account of a number of failures which have occurred in Government buildings, the inquiries received by the Bureau for information concerning methods of preventing the cracking of stucco, the durability of various kinds of metal lath, the cause of discoloration of plasters, the proper mixtures to be used, etc., and the general lack of reliable information

in this field. This investigation will extend over a number of years and involves both laboratory and field work.

Effect of Sea Water on Concrete.

The investigation of the effect of sea water on concrete has been continued by inspecting many concrete structures along the Atlantic and Pacific coasts of the United States, the coast of Nova Scotia and New Brunswick, and collating information on the condition of concrete structures exposed to sea water in various ports of the world. It is anticipated that during the ensuing year a report will be prepared showing the conditions under which concrete should be used in order to have permanency under sea water exposure. The results of this investigation will be of value to the Government and all engineers interested in marine construction.

Silica Cements.

The study of sand or silica cements has been continued and a report giving two years' results will be prepared during the ensuing year. The Reclamation Service are now using this type of cement on some of their western projects and the investigation was made with their cooperation. As the cost of silica cements is only about 60 per cent of that of Portland cements, if they are found to have comparable cementing value, they would greatly reduce the cost of concrete structures. The cooperation of the War Department was also obtained in connection with this investigation, as they had used some silica cements in 1899 and 1900.

Results of Specification Tests of Portland Cement.

A collation of all specification tests of Portland cements made by the Government laboratories since 1901 is being prepared for publication. Such a report will be of general interest to the manufacturer and consumer of cement giving as it does the chemical composition and physical qualities of about 90 per cent of the American brands.

Variation of the Physical Properties of Concrete.

A study of several thousand compression tests is being made of concrete which was fabricated and exposed in various ways. It will be shown by this study what precautions are necessary in the fabrication of concrete to ensure a product of known quality. This will be of interest to all consumers of cement. The Bureau is constantly receiving inquiries concerning concrete, the elements of which will be discussed in this paper.

Cement Inspection and Testing.

Cement was inspected during the year at 13 different cement mills located in Virginia, Maryland, Pennsylvania, New Jersey, New York, Ohio, Indiana, Kentucky, and Kansas. The inspection work included the taking of samples, their testing, and the subsequent inspection of packing and shipping. A total of 7,610 samples were tested for the Navy and War Departments, Bureau of Lighthouses, Isthmian Canal Commission, Supervising Architect's Office, District of Columbia, Lincoln Memorial Commission, etc. Inspection was

made of 599,400 barrels of cement for shipment to Panama and 148,385 barrels for shipment to Government departments in the United States, for use in the construction of Federal buildings, river and harbor improvements, etc. The testing of cement at the Pittsburgh branch has also been for Government bureaus, particularly the United States Army Engineers. The necessity for this inspecting and testing of cement is well illustrated by the fact that out of 265,518 barrels sampled, 32,200 barrels have been rejected. In addition 4,200 barrels have been withdrawn by the manufacturer, since he recognized the inferiority of the material he submitted before we were ready to start our tests. This cement has been submitted by plants as distant from Pittsburgh as Kentucky and Indiana.

Information Furnished as to Cement and Concrete.

Many inquiries were received during the year from architects, engineers, contractors, and builders who sought information concerning methods of waterproofing concrete, the value of waterproofing compounds, methods of construction to be employed in sea water, effect of using sea water for mixing concrete to be placed in sea water, physical properties of concretes of various mixtures, the cause of staining of plaster walls and ceilings, the relative value of various concrete aggregates, the cause of failure of magnesite composition floors, methods of preventing the dusting of cement floors, methods of designing concrete road slabs, suggestions for building code requirements, etc.

From the general public requests were received for information on methods of mixing concrete, laying of concrete sidewalks, waterproofing basements, suitability of various materials for use in concrete, design of concrete piles for use in sea water, durability of composition magnesite floors, the physical properties of stones, the cause of failure of drain tile, etc.

From cement manufacturers, architectural stone manufacturers, commercial testing laboratories, requests were received for information on the accuracy of sieves, the physical properties of concrete, the value of fine grinding, the value of silica cements, cause of failure of drain tile, effect of sewage combined with sea water on concrete, the value of high pressure steam tests, methods of testing materials, cause of shrinkage of architectural stone, the interpretation of cement specifications, etc.

Investigation of Paving Blocks.

A study of the toughness of paving blocks which have been taken from pavements of various ages in 12 cities was made. The method of construction, wear, and condition were noted, and the resistance of the blocks of abrasion determined by means of the standard rattle. Blocks of medium toughness and strength were found to give satisfactory service if put down well, viz, with good concrete foundation, uniform and well-rolled sand bed, and good grouting. The better the quality of the blocks, the less sensitive the pavement will be to defects in construction.

Study of White-Ware Glazes.

A study has been carried on of glazes for white ware and vitreous pottery, free from lead oxide. A well-fused glaze of good appear-

ance was found but it possesses certain disadvantages which have been pointed out.

Behavior of Clay in Water Suspension.

The behavior of clay in water suspension under the influence of a direct current was observed. It was shown that the attraction of the clay by the positive electrode was a factor in the purification process only when iron is present in the granular form, viz, as pyrite, siderite, etc. Clay containing colloidal ferric oxide is not freed from the latter. The main factor in the elimination of ferruginous impurities is the preliminary process of deflocculation by means of caustic soda, sodium oxalate, or tannic acid. The electrical conductivity of clays with varying water content was studied.

Viscosity of Porcelain at Kiln Temperatures.

The viscosity (tendency to soften) of a series of porcelains at kiln temperatures was determined. It was found that the viscosity increased rapidly with the kaolin content. The present American porcelains are working with too low a clay substance content. By raising the proportion from 44 to 50 per cent, better standing up qualities are obtained.

Plasticity of Clays.

Three sections of an investigation dealing with the plasticity of clay have been completed, one dealing with the compression, tensile and transverse strengths of clays in the dried state, one with the flow of clay under pressure through an orifice, and one with the critical study of the method proposed by Atterberg for the estimation of plasticity. The work upon the plasticity of clays is being continued with special reference to methods of measurement. This problem is a very difficult one whose solution appears to be in the accurate study of the mechanical properties of clays in the plastic state with particular reference to deformation and flow under pressure.

An extensive research is under way, relating to the effect of dissolves salts upon clay suspensions. This work has special significance, owing to the fact that application is made of these phenomena in the industries, especially the manufacture of sanitary ware and pottery, in which hand molding is being replaced by the casting process. The principles underlying the changes brought about by the addition of small quantities of salts are not of a simple nature. The work carried out so far shows the injurious influence of clays carrying soluble sulphates, like the ball clays, and the surprising effect of air entrapped by the clay substance. The benefits obtained by the exhaustion of air from the suspension have been brought out.

Suitability of American Clays for Vitreous Ware.

Several series of investigations are being carried out in connection with the study of porcelain, having in mind, first, the most feasible combination of American clays for the production of vitreous dinner ware; second, the most practicable composition of chemical porcelain, made entirely if possible from American materials. The chemical porcelain used in this country has so far been imported and with the great demand for this kind of product, it seems very

necessary that the establishment of this industry be encouraged. Such problems as the determination of translucency are coincident with the first part of this investigation, dealing with vitreous table ware. The comparison between American and European kaolins and ball clays is an essential part of this work.

Ceramic Glazes.

Considerable work is being done in connection with ceramic glazes. The most urgent problems are being selected, such as the production of a cheap, one fire enamel, to be used in the manufacture of enameled brick and tile. A collection is being made of glazes and enamels, for all kinds of products which have proven useful, for later publication. The study of cast iron enamels, possessing maximum resistance to the action of acids, is contemplated for the coming year. Crystalline glazes of the zinc silicate type are being prepared for microscopic study by the petrographer.

Drying Properties of Clays.

Physical studies are being made of the drying of clays by means of a specially designed oven in which the critical points during this process are being observed. The effect of small additions of electrolytes are also being studied in this connection. A study is being made of the effect of the size of grain upon the drying and the vitrification of shales.

Clay-Shrinkage Disks.

A system of clay-shrinkage disks, which are used largely by pottery manufacturers for the control of their kilns, has been correlated with the temperatures to which the shrinkages indicated by the standard gauge correspond.

Production of Paving Bricks from Slag.

The work upon the production of paving blocks from fused slag is being continued. The results previously obtained in small laboratory furnaces are now to be utilized in actually making slag blocks of practically commercial size by the use of a sufficiently large furnace.

Strength of Refractory Bodies.

A research is to be begun dealing with the study of the strongest refractory bodies subjected to compression at temperatures from 1,300° to 1,400° C. Owing to the heavy losses caused in the ceramic and other industries by the breakage of saggars, glass pots, supports, etc., this problem is of considerable practical importance. Part of this work will embrace the comparison of American and European bond clays for the purpose of eliminating the latter if possible. At present considerable amounts of these materials are being imported.

Effect of Crystalline Salts upon the Structure of Clay Products.

The effect of crystalline salts upon the structure of clay products is to be studied in a series of tests. This work was begun during the past year and it was shown by the destructive effect of such salts as sodium sulphate, sodium thiosulphate, magnesium sulphate, and sodium chloride that a well-defined limit existed between clay ware

standing up or failing under this treatment. Clay burnt below 950° C. failed without exception. It is hoped that a test will be developed which will tell quickly whether a product will prove durable under weather conditions or not.

Investigation of Building Tile.

A building-tile investigation is under way. Data collected has largely been along the line of determination of proper loading for building inspectors. This is to be followed by tests to determine bearing power and properties of tile walls, in relation to brick and other material, fireproofing qualities, etc.

Resisting Power of Earth.

An investigation has been authorized for the determination of the properties of earths in relation to sustaining power of piles, foundations, effect of moisture, viscosity effects on time rate of depression under loads, standardization of soils for the structural purposes of engineering, etc. This investigation is in cooperation with the committee of the American Society of Civil Engineers.

Strength of Brick Piers.

A brick-pier investigation has been under way for some time which will be representative of the bricks manufactured east of the Mississippi, covering four principal geographical centers of manufacture. A study is being made of bonds, comparative strength of mortars, qualities and properties of brick, both individually and collectively, in piers of various heights. The members are of a size commensurate with those in practice.

Composition of Window Glass.

An investigation has been started concerning the limits of the composition of window glass, with reference to the magnesia content, and with reference to the content of alumina. In the literature on glass many contradictory statements are made concerning these two constituents, and it is hoped that the facts may be brought out.

Testing of Clay Products.

The testing done by the clay products section for the Government, especially the Isthmian Canal Commission, consisted of 250 physical tests. In addition clay testing was done for the United States Geological Survey, covered by the time of one man for three months. These tests referred to samples of fire clay collected by the Survey in eastern Pennsylvania and Maryland. Considerable time was spent in the preparation of a technical report on the white-ware pottery industry for the Bureau of Foreign and Domestic Commerce. Co-operative tests are also under way for the Geological Survey of Florida.

A considerable number of tests, approximately 160, were made for the public, usually free of charge, and comprised preliminary tests of clay as well as special tests and inquiries pertaining to defects and manufacturing troubles. In addition, 157 tests were made for the public for which fees were required. The correspondence with manu-

facturers of ceramic products has been very heavy. In many instances manufacturers have called at the ceramic laboratory with specimens of the raw materials or finished products. In unusual cases trips have been made to the plants at the expense of the manufacturers.

Cooperation with Technical Societies.

The Bureau cooperates also with educational institutions and technical organizations by contributing papers and articles to their transactions, and taking part in their discussions. Such cooperation is being carried on with the American Ceramic Society, the American Society for Testing Materials, the National Brick Manufacturers' Association, the National Paving Brick Manufacturers' Association, and a number of State organizations.

Sand Lime Brick.

The action of CO_2 when introduced into the hardening cylinder during the manufacture of sand lime brick, has been found to give a product having a compressive strength about 50 per cent higher than brick produced without the CO_2 . This should enable the manufacturers of sand lime brick to improve the quality of their product, with little extra expense, and should therefore be advantageous to the users of brick, or the general public.

Strength of Lime Mortars.

Measurements of the various strengths of lime mortars show, first, that these strengths are generally low, and second, that laboratory measurements are not reliable. These results are negative only, but should prove of interest to architects and engineers. The shearing strength of a lime mortar is somewhat less than its compressive strength. The area in shear should be about one and one-half times the area in compression, in order to measure the shearing strength.

Properties of Lime.

A method has been developed by means of which it is possible to tell beforehand whether or not a lime plaster will "pop" or "pit" on the wall; that is, whether small particles will fall out and leave pin holes. This test should be valuable to lime manufacturers, plasterers, and owners, by eliminating, or at least fixing the responsibility for, "popping."

It has been found that hydrated lime spoils by air-slaking quite rapidly when stored in the ordinary commercial packages. This fact is of especial interest to the dealer and the small user.

The quantity of sulphur in a lime bears a certain general ratio to the amount originally present in the stone plus that in the fuel used to burn the lime. This is of importance to the lime manufacturer because the presence of sulphur is frequently the cause of inferior quality of the lime.

The amount of carbon dioxide in a lime (which is indicative of the amount of air-slaking) can be determined rapidly and with fair accuracy by titration, using phenacetolin as an indicator. This method is not scientific, but can be used for plant control by the manufacturer, or for inspection by the user.

Effect of Temperature During the Hydration of Lime.

When lime is slaked there is a tendency toward local overheating of the material with the production of "lime which has been burned during hydration." It is believed that the presence of this material is the cause of popping, and also of the lack of plasticity in some commercial hydrates. An attempt is being made to find out what this material is, how it is formed, how its formation can be prevented, or how the effects of it can be nullified. Its isolation has not been accomplished as yet. The material is believed to be formed whenever the temperature in any part of the mass of lime and water is permitted to exceed 350° C.

Plasticity of Lime.

Whenever lime is used for masonry or plastering purposes its use depends primarily on its plasticity, or working quality. This property must therefore be included in any rational specification for lime. The development of a test for plasticity has been carried out along lines suggested in Merriman's "Mechanics of Materials," and the test is now being applied to commercial hydrates of known working qualities, in order to determine its value. It is believed that the plasticity of hydrated lime depends to some extent on the size of grain of the material. Commercial hydrates have been separated into grains of different size by elutriation (water flotation), but this question can not be finally answered until the method of measuring plasticity is fully developed.

Use of Lime in Portland Cement Mortar.

It has been found that as much as 25 per cent hydrated lime can be used in a Portland cement mortar without material diminution of strength, whether the lime is magnesian or high calcium, and whether the mortar is permitted to set in the air or under water. These conclusions are based on tests of specimens 1 year old. Specimens have been made up to be tested when 2 and 5 years old.

Properties of Gypsum.

An investigation is being made of the physical, chemical, and optical properties of gypsum, which has been calcined at different temperatures, in an attempt to throw some light on the behavior of some of these products which at present appear inexplicable.

Lime Testing.

The commercial testing of lime done by the Bureau has been very limited, and is confined almost exclusively to locating the cause of an inferior quality of product, at the request of manufacturers.

Information as to Lime and Its Products.

Requests for information come mainly from present manufacturers in regard to quality of product; prospective manufacturers, in regard to plant equipment; and users who wish to know the location of the nearest producer and the quality of his product. Under users is included a large number of inquiries about the properties of sand lime brick. The National Lime Manufacturers Association and

the American Society for Testing Materials have committees which are attempting to write specifications for lime. The Bureau is co-operating with both of these committees.

Textile Investigations.

Owing to the large amount of textile testing done for the Government in connection with the purchase of textiles, and the adoption of the new tariff schedule, it has been impossible to take up any new investigational work, some of which is very badly needed in connection with the improvement of the methods of testing textiles and their specification. A few of the most urgent are as follows: (1) The moisture content of cotton, wool, silk, and linen yarns and fabrics at various atmospheric conditions. (2) The correctness of worsted yarn numbers, the percentage of oil present, and the tensile strength of those sizes of yarns having a large consumption. Many mills have furnished yarns for this investigation but we have been unable to proceed with this work. (3) The effect of twist upon the tensile strength of cotton, wool, and linen yarns and the amount of twist that will give the maximum tensile strength. (4) The cotton spool-thread investigation. (5) The development of better methods of testing and cooperating with the textile trade relative to adopting standard methods for tests. (6) The quantity of sizing and loading material in cotton cloth and its effect upon the strength of the fabric. Strength of various sizes of yarns should be a valuable one for our yarn manufacturers, buyers, sellers, and the textile trade in general. (7) The effect of humidity upon cotton and wool cloth relative to weight and tensile strength. (8) Investigation of adulterated textile articles now upon the market. There is complaint by consumers everywhere that textiles are misbranded and misrepresented by the mills producing them, by the middlemen and by those selling them over the counter in stores.

Shrinkage of Wools.

By shrinkage is meant the total loss of weight in raw wool, due to the removal of all grease, dirt, or other foreign matter. This information is needed by wool growers, manufacturers, commission merchants, and especially by those interested in the question of placing the testing and sampling of wool on a more scientific basis.

This investigation was made (1) to obtain some definite knowledge as to the shrinkage of some of the foreign raw wools imported into this country, (2) to ascertain the shrinkage variation in two samplings of the same fleece, and (3) the difference in shrinkage between two fleeces of the same breed of sheep. There were 49 fleeces experimented upon, and the shrinkages ranged from 19.5 to 54 per cent, i. e., the yield of clean wool was from 80.5 to 46 per cent, according to the breed of the sheep. In the South Australian wools the greatest shrinkage difference between two determinations upon the samples drawn in the same manner from the same fleece was 3 per cent, while for the New Zealand wools the largest difference was 6 per cent. The differences were calculated on the basis of raw wool weight. The difference in shrinkage between two fleeces of the same breed of sheep grown in the same location was found to be as great as 9.5 per cent.

Information as to Textiles.

The Bureau is assisting the Department of Agriculture in determining the maximum temperature Egyptian cotton fiber can be heated without causing deterioration to its strength. This information is desired in connection with an extended investigation by that Department of the injurious effect of the pink boll worm (an insect very injurious to cotton fiber) found in imported Egyptian cotton.

The Bureau has published for distribution Technologic Paper No. 19, on "The physical properties of cotton yarns," also Circular No. 41, which gives a general outline of textile analyses performed by the Bureau, drawing attention to particular conditions and methods of test that should be followed, precautions to be exercised, rates of charges, etc. This circular has served in a very large way to educate the textile trade along the lines of more scientific buying and selling of textiles.

During the year the Bureau tested over 2,400 samples of textiles, mostly of materials purchased by the Government. These included cotton, silk, and linen cloths, spool thread, tracing cloth, areoplane cloth, automobile-tire fabric, sail cloth, canvas, tent cloth, table linens, artificial silks, wool cloth adulterated with cotton, cordage, etc.

The Bureau was called upon as referee in a controversy between a cotton mill and a consumer of large quantities of automobile-tire fabric. Tests were made upon samples of fabric.

The textile section of the Bureau has assisted in the drafting of textile specifications, particularly for Government purchases, and to some extent for the public. It has rendered valuable assistance in court cases, and assisted various committees. The Bureau cooperated with the Bureau of Foreign and Domestic Commerce in the testing of domestic and foreign-made jute bagging for cotton. This work was of considerable value and the results were published by that Bureau in a pamphlet entitled "Cotton bagging and ties," October 20, 1913.

A special report was made to the Ways and Means Committee, House of Representatives, relative to methods of testing cotton cloth for duty assessments under the new tariff law.

The Customs Service at the Appraisers Stores, New York, were furnished a short and accurate method of determining the yarn number upon imported cotton, wool, silk, and linen yarns.

A complete revision of the textile specifications of the material purchased on the "General supply schedule" was furnished to that committee. The Bureau drafted specifications for the purchase of textiles required by the Office of Indian Affairs, Department of the Interior. In the case of both offices mentioned above the textile section tested the bidder's samples and assisted in the making of all awards for contracts for the fiscal year ending June 30, 1915.

At the request of the Treasury Department, a representative of this Bureau visited the New York Appraiser's Stores, made a report of the textile work there, and suggested more efficient methods of appraising importations.

The War and Navy Departments were assisted in their textile specifications and in the matter of testing various materials under dispute.

Several bills before Congress relating to the enactment of a "pure-fabric law" were submitted to the Bureau for criticisms and suggestions.

Paper Investigations.

A study of the causes of deterioration of paper for permanent records has been undertaken and will be advanced as fast as possible. The results of such a study will be of utmost importance to the general public.

The question of the influence of atmospheric moisture on paper during the process of color printing has been suggested by lithographers and printers as a problem of great importance to the printing industry. Work along this line has been started.

The investigation on buttermilk caseins and its application to the paper industry for sizing and coating paper, is well under way. The results obtained so far indicate that buttermilk caseins will have almost as large a field of usefulness as skim-milk caseins. To facilitate this investigation the Bureau has installed a complete machine for coating paper. Cooperative work with mills making coated paper is in progress, and one mill has given assurance that it will assist the Bureau to make the final determinations on a commercial scale. This mill has already given much valuable assistance. The final results of this investigation will be of value to the dairy, paper, paste, and other industries using casein. Buttermilk, now a waste product, may be turned into a new source of supply for usable casein, and at the same time lower the cost of casein to the industries.

The past year's work of the paper laboratory has clearly demonstrated that investigation work has been seriously handicapped, due to the large amount of routine work required by the departments and the small laboratory force available for this work.

Paper Conference.

The second annual conference between paper manufacturers, commercial testing laboratories, and this Bureau was held at the Bureau of Standards. This conference has resulted in establishing a closer spirit of interest and cooperation between the parties concerned and has enabled this Bureau to present the Government paper requirements to the manufacturers. These conferences will be held annually and for the purpose of affording an opportunity for discussions along technical lines relating to the paper industry. This annual yearly conference will result advantageously to the entire paper industry, as well as the public.

Paper Testing.

During the past year the Bureau has tested the following samples of paper: For all Government departments, 2,749 samples; for public and private interests, 242 samples; total number of samples tested, 2,991. These tests were made for practically all departments of the Government, the Government Printing Office, and other establishments. This large amount of routine work has made it almost impossible to give much attention to those investigations which have been undertaken.

Information as to Paper.

In addition to the routine testing of paper purchased by the executive departments, they have been given every possible assistance both in the preparing of paper specifications and in securing papers best suited to their particular needs. Such assistance has enabled the Government to substitute lower priced paper for the higher grades, and in a few instances it has been pointed out that a higher grade ought to be used. The question of chart paper for the United States Coast and Geodetic Survey has received considerable attention, and it is believed that the investigations along this line will result in securing a chart paper of higher quality.

The circular on paper and paper testing is nearly completed. It will enable the small user to more correctly judge a paper for a particular use.

Suggestions have been received from a number of paper companies that this Bureau take up the standardization of paper and paper testing not only as applied to Government purchases, but also as applied to the entire paper industry. Such standardization would be of great importance and benefit to both manufacturers and consumers of paper. This work should be undertaken by the Bureau.

Hack-Saw Blades.

An investigation to determine the relative efficiency of different makes of hack-saw blades has been in progress for more than a year. This work was undertaken at the request of the Government and a committee of manufacturers of hack-saw blades. The results thus far obtained indicate that the specifications in general use are inadequate to determine the wearing quality of blades. The work, which has been subjected to numerous interruptions, will be pushed as rapidly as possible with the view of developing reliable tests and specifications.

Properties of Rubber.

A study of the physical properties of rubber, with special attention to the influence of temperature on these properties, has been continued during the past year. In conducting this work practically all of the apparatus and testing machines have been designed and constructed at the Bureau. The results of many tests that have been made, both on routine samples and on samples secured for experimental work, will be used in revising Circular No. 38, which illustrates and describes the apparatus and methods employed in testing rubber at the Bureau. This circular is now in its second edition and the demand for it is steadily increasing.

An experimental rubber mixing and vulcanizing plant has been installed, and is now ready for operation. This plant will be of great value to the Bureau in preparing samples of definite composition which will be used for experimental work both in the physical and chemical laboratories. The Bureau has already rendered valuable assistance both to manufacturers and consumers in improving existing methods of testing and in designing special apparatus to expedite and facilitate the various tests.

In addition to the many tests of rubber made for Government departments, the Bureau has cooperated with technical societies and with manufacturers in developing specifications and methods of testing. Numerous requests have been received for working drawings of the testing machines that have been developed at the Bureau, and in every case the desired information has been supplied. A number of these machines have been adopted by the leading rubber manufacturers of the country and by some of the largest testing laboratories engaged in the testing of mechanical rubber goods.

Tests of Miscellaneous Materials.

A total of 1,347 samples of miscellaneous materials, principally for Government departments, were tested during the year. These included 200 samples of rubber hose, 644 samples of packing (rubber asbestos, etc.), 45 samples of rubber bands, 69 samples of rubber covered wire, 135 samples of asbestos gaskets, 41 samples of leather belting, 71 samples of rope, 28 samples of hack-saw blades, and others.

8. ENGINEERING RESEARCH AND TESTING.

Applications of the Dimensional Method to Physical Problems.

An investigation of the dimensional method of attacking physical problems is under way. The "Principle of dynamical similarity," necessary in the interpretation of experiments on mechanical models (ships, aeroplanes, etc.) is the most familiar instance of the application of this method; but the importance of the method is much greater, especially in technical physics, and its applicability far wider than has commonly been recognized. A general and fully illustrated exposition of the subject is in preparation, several preliminary papers dealing with special chapters having already been published in scientific and technical journals.

Windage Resistance of Steam Turbines.

A general equation was deduced from the theory of dimensions, which is shown to agree with such experimental data on windage as have been published. The data at present available are not adequate as a basis for the computation of windage corrections, except in a few simple cases. (See Scientific Paper No. 208.) The data are analyzed and suggestions offered as to practical computations. By applying the principle of dynamical similarity, it is shown that model experiments may be utilized and the practicability of such experiments is discussed.

The problem is an important one in turbine design and operation.

Water-Current Meters.

During the past year 266 calibrations of current meters, used for the measurement of the velocity of flow of water in streams, open channels and ocean currents, were made by the Bureau for the United States Geological Survey, Reclamation Service, and other Government departments, State governments, and engineers in private practice.

The number of instruments submitted for test showed an increase of 33 per cent over the previous year.

To provide better conditions for the routine rating of these important instruments and facilities for a comprehensive investigation of the characteristics of the different types, a concrete tank 400 feet in length has been constructed and special apparatus for automatically recording data has been designed. The new station will be in operation early in the next fiscal year.

Anemometers.

Within the last year or two there have been frequent requests for information relative to the use of anemometers of the vane type for the measurement of air velocities encountered in fan, ventilating, and similar work. These instruments are distinct from those used for meteorological measurements. Requests have been made for tests as high as 10,000 feet per minute. The Bureau is unable to make these tests or supply the information requested. An investigation to determine what instruments are suitable for this service, their characteristics, and the best method of calibration, would furnish data which is greatly needed by engineers in this field.

Gasoline Engines.

The Bureau has installed a gasoline-engine testing plant for determining the power and fuel consumption, at various speeds, of motors such as are used in automobiles, motor boats, and aeroplanes. Preliminary tests were made on two Renault aeroplane motors for the United States Signal Corps.

This apparatus was installed by and is to be used in cooperation with the Signal Corps, in order to furnish reliable means for testing such motors as they might acquire or contemplate purchasing.

Vacuum Traps.

A request was received from the Supervising Architect of the Treasury Department for data to be used in the preparation of specifications for purchase of vacuum traps used in the steam-heating systems of Government buildings. Special apparatus has been constructed for this purpose, and an investigation of the operation under working conditions of some 18 different makes of traps is now in progress.

Hose Couplings.

The great benefits that would result from a standardization of fire-hose couplings has long been recognized, and lack of uniformity in this respect has been responsible for great loss of life and property in certain large conflagrations, such as the Baltimore fire in 1904, when fire engines sent from other cities in response to calls for aid were unable to render assistance for the reason that their hose couplings, being of different design, would not couple up with the local fire-hose connections.

This Bureau has for a number of years been in cooperation with leading fire-protection organizations of the country with the view of establishing a standard fire-hose coupling. As a result of this cooperation, a large number of cities and the leading fire-protection associations have adopted a standard design known as the national standard fire-hose coupling. In order to render this important move-

ment as far-reaching as possible, the Bureau of Standards has prepared a circular outlining the history of the undertaking and setting forth the advantages to be derived from the general adoption of the standard coupling.

Miscellaneous Instruments and Devices.

As a result of tests completed by this Bureau during the past year for the Treasury Department, portable vacuum cleaners supplied to that department for use in public buildings under its control are now purchased under specifications, by the provisions of which the efficiency and effectiveness in operation of these machines may be determined and compared by simple tests.

In addition to the rating of current meters, 145 tests of other instruments were made, including steam, vacuum and hydraulic gauges, water meters, fire extinguishers, valves, vacuum cleaners, dynamometers, paper tester, and miscellaneous devices.

Facilities Needed for Engineering Research.

The large and steadily increasing demands made upon the Bureau for routine tests of this nature render it impossible, with the present working force, to make satisfactory progress in the several lines of investigation that have been undertaken. There are many important engineering researches that should be undertaken and perhaps no greater assistance could be given both the Government service and the manufacturing interests of the country than by the development of adequate facilities for such researches. The Bureau's work in this field has scarcely begun and is limited almost exclusively to a few of the more pressing cases of the Government service.

III. OFFICE, AND ENGINEERING AND CONSTRUCTION.

1. OFFICE.

Publications.

During the past year the Bureau issued four numbers of the Bulletin of the Bureau of Standards, completing the tenth volume of the bulletin; 23 scientific papers; 11 technologic papers; 5 circulars; and 2 miscellaneous publications, a total for the year of 41 Bureau publications.

The following new circulars were issued during the year: "Metallographic testing," "The metric carat," "Polarimetry," "The testing of materials," and "The testing of barometers."

The following scientific papers were issued: "New calorimetric resistance thermometers," "The silver voltameter—Part III, second series of quantitative experiments and the preparation and testing of silver nitrate," "Note on cold-junction corrections for thermocouples," "The analysis of alternating-current waves by the method of Fourier, with special reference to methods of facilitating the computations," "The constants of spectral radiation of a uniformly heated inclosure, or so-called black body, I," "Melting points of the refractory elements; I, Elements of atomic weight from 48 to 59," "High-frequency ammeters," "A comparative study of American direct-current watt-hour meters," "Windage resistance of steam-turbine wheels," "Latent heat of fusion of ice," "Observations on ocean

temperatures in the vicinity of icebergs and in other parts of the ocean," "Accuracy of the formulas for the ratio, regulation, and phase angle of transformers," "Melting points of some refractory oxides," "Critical ranges A2 and A3 of pure iron," "Note on the setting of a mercury surface to a required height," "Micrometer microscopes," "The pentane lamp as a working standard," "Testing potential transformers," "Comparison of the silver and iodine voltameters and the determination of the faraday," "Production of temperature uniformity in an electric furnace," "The silver voltameter—Part IV, third series of quantitative experiments and special investigations," and "Flame standards in photometry."

The following technologic papers were issued: "Surface insulation of pipes," "Electrolysis in concrete," "Electrolytic corrosion of iron in soils," "Special studies in electrolysis mitigation, I, a preliminary study of conditions in Springfield, Ohio, with recommendations for mitigation and control," "Variations in results of sieving with standard cement sieves," "The viscosity of porcelain bodies," "Some leadless borosilicate glazes maturing at about 1,100° C.," "Special studies in electrolysis mitigation, No. 2, electrolysis from electric railway currents and its prevention—an experimental test on a system of insulated negative feeders in St. Louis," "Determination of carbon in steel and iron by the barium carbonate titration method," "Determination of ammonia in illuminating gas," and "Combustion method for the direct determination of rubber."

The following miscellaneous publications were issued: "Annual report of the Director for the fiscal year ended June 30, 1913," and "Eighth annual conference on the weights and measures of the United States."

In this connection it should be stated that the length of time required to print the scientific and technical papers of the Bureau often necessitates preliminary announcements through the technical press instead of by Government publication. This is to be regretted, and it is hoped that more prompt methods may be found to eliminate all possible causes of delay. The decrease in the Department's allotment for printing may hamper the Bureau in new publication and keeping in stock publications required in the ordinary conduct of its business.

Delays occur in the present indirect method of forwarding franks to the Superintendent of Documents. As the Bureau is located at a distance from the city, the franks addressed at the Bureau should be sent by messenger direct to the Printing Office. The documents, it is believed, could then be mailed the same day when necessary, or in emergencies the messenger could assist in inclosing them. At present, the Bureau can not remedy the delay which in many cases is a week or more. The urgent reason for a more direct system is that in many cases the publications should really be sent as inclosures in letters, since they are intended as a part of the reply giving information desired.

Library.

The Bureau maintains a working library of reference and current periodicals on subjects directly connected with the Bureau's work. It contains nearly 12,000 volumes related to its work. Those

engaged in research and investigation work must have available the reference works required for consultation without overcrowding the library with books which may be borrowed from other scientific libraries of the city. The cooperation of such libraries in the loan of books, developed during the past few years, has proved to be of great assistance in scientific work.

Correspondence.

A large amount of technical correspondence in addition to the necessary routine connected with tests and the business administration of the Bureau requires a competent force of clerks. In the file rooms approximately 55,000 letters were handled during the year. The files are by subject and are indexed by card catalogue. The vertical files of the unit system have been in use since the Bureau was established and have been found very convenient. The increase of about 40 per cent in the amount of correspondence over the previous year has taxed the force required to handle it. Assistance will be required to do the work efficiently.

Storeroom.

In the storeroom is centralized the purchase of standard stock and supplies and the care and record of property. The property record is maintained as a card catalogue, classified by serial number assigned when equipment is received at the Bureau. A duplicate card is classified according to the nature of the equipment. A record is also maintained classified by divisions to which the equipment is assigned. The inventory property of the Bureau now includes, approximately, 50,000 items, a large portion of which includes scientific apparatus. With the growth of the equipment and the increasing work connected with property records, it is necessary that a high-grade clerk be provided to serve as a property clerk for this equipment.

Personnel.

During the year the Bureau staff comprised 230 statutory appointees, and about 107 engaged in researches and investigations specially authorized by Congress. The statutory positions included 144 scientific positions, 29 office assistants, 33 engaged in the operation of the plant, and 23 in the construction. There were 446 personnel changes during the year. These included 105 separations from the Bureau, of which 38 were resignations. In the consideration of civil-service certificates, it may be of interest to note that 62 eligibles declined appointment, 11 of whom declined after acceptance and appointment.

The work of appointments is greatly embarrassed by the difficulty of securing suitable eligibles for many of the places, also by the delay usually from one to three weeks in receiving certificates after making request.

The routine connected with personnel actions is also involved, new appointments, for example, requiring about 30 distinct steps in the ordinary course.

Appropriations and Accounts.

With the responsibility resting on the Bureau to audit accounts prior to payment, the labor of examining accounts has increased.

The volume of Bureau accounting has increased threefold during the past few years. A much closer accounting system has been adopted, which permits systematic summaries showing the itemized detail for each class of expenditure and for each appropriation by administrative divisions of the Bureau. The system and form of statement were developed at the Bureau and is believed to be in many respects the simplest and most complete statement of Bureau expenditures which has ever been in use. The design and installation of dispatch boards covering the various branches of the work of the office has distinctly aided the Bureau in keeping track of its routine work. While it can not prevent delays due to lack of assistance, the system has made it possible to keep the closest track of outstanding work and schedule business.

Attached hereto are tables showing the amount and object of each outstanding appropriation, together with the disbursement and balances up to June 30, 1914. The first statements cover the appropriations for the fiscal year ended on that date. The second table covers the outstanding disbursement and adjustments on account of the appropriations for the fiscal year 1912 and 1913, respectively.

The following statement shows the amount and object of each appropriation provided for the Bureau for the fiscal year 1914, the disbursement during the year, the amount of unfilled and unpaid orders at the close of the year, and the unexpended balance remaining at the close of business June 30, 1914:

| Appropriation. | Total appropriation. | Disbursement. | Liability. | Balance. |
|---------------------------------------|----------------------|---------------|-------------|-------------|
| Salaries..... | \$290,940.00 | \$258,528.85 | \$11,595.03 | \$20,816.12 |
| Equipment..... | 60,075.00 | 56,132.40 | 3,854.49 | 88.11 |
| General expenses..... | 25,200.00 | 19,357.52 | 4,788.13 | 1,054.35 |
| Grounds..... | 3,000.00 | 2,888.27 | 111.73 | ..... |
| Testing structural materials..... | 75,000.00 | 69,961.65 | 4,991.35 | 47.00 |
| Testing machines..... | 30,000.00 | 24,204.20 | 5,777.23 | 18.57 |
| High potential..... | 15,000.00 | 13,757.64 | 1,214.85 | 27.51 |
| Refrigeration constants..... | 15,000.00 | 11,434.63 | 3,552.99 | 12.38 |
| Testing railroad scales..... | 25,000.00 | 18,573.23 | 6,389.92 | 36.85 |
| Fire-resisting properties..... | 25,000.00 | 9,404.45 | 15,047.73 | 547.82 |
| Warehouse and storehouse..... | 45,000.00 | 18,623.39 | 24,226.99 | 2,149.62 |
| Tank..... | 5,000.00 | 4,964.05 | 31.50 | 4.45 |
| Equipment, electrical laboratory..... | 25,000.00 | 24,942.38 | 50.43 | 7.19 |
| Laboratory..... | 200,000.00 | 197,356.50 | 1,594.44 | 1,049.06 |
| Total..... | 839,215.00 | 730,129.16 | 83,226.81 | 25,859.03 |

The following statement shows the condition of the appropriations for the two preceding fiscal years at the close of business June 30, 1914:

| Appropriation. | 1912 | | | |
|---|----------------------|---------------|------------|-------------|
| | Total appropriation. | Disbursement. | Liability. | Balance. |
| Salaries..... | \$236,340.00 | \$224,050.96 | ..... | \$12,289.04 |
| Equipment..... | 52,027.50 | 50,586.89 | \$1,188.94 | 251.67 |
| General expenses..... | 25,702.77 | 25,320.03 | 47.35 | 335.39 |
| Grounds..... | 3,000.00 | 2,892.03 | ..... | 107.07 |
| Testing structural materials..... | 78,533.50 | 77,988.62 | 248.62 | 296.26 |
| Testing machines..... | 30,000.00 | 29,793.92 | ..... | 206.08 |
| Investigating effects of electric currents..... | 15,000.00 | 14,877.31 | 3.65 | 119.04 |
| Total..... | 440,603.77 | 425,510.66 | 1,488.56 | 13,604.55 |

| Appropriation. | 1913 | | | |
|---|----------------------|---------------|------------|-----------|
| | Total appropriation. | Disbursement. | Liability. | Balance. |
| Salaries..... | \$241,312.66 | \$226,682.95 | | 14,629.71 |
| Equipment..... | 51,000.00 | 49,462.50 | \$1,537.50 | 381.00 |
| General expenses..... | 23,200.00 | 22,701.09 | 498.91 | 316.01 |
| Grounds..... | 3,000.00 | 2,986.81 | | 13.19 |
| Testing structural materials..... | 77,342.50 | 77,045.29 | 297.21 | 297.21 |
| Testing machines..... | 30,000.00 | 29,839.03 | 160.97 | 160.97 |
| Investigating effects of electric currents..... | 10,000.00 | 9,919.63 | 80.37 | 80.37 |
| Refrigeration constants..... | 15,000.00 | 14,597.86 | 402.14 | 402.14 |
| Total..... | 450,855.16 | 433,235.16 | 1,787.04 | 15,832.96 |

Summary of Tests and Fees.

The work of the Bureau involves, among other things, a large amount of testing of standards, measuring instruments, and materials. Much of it involves investigation of the scientific principles underlying the test, a study of existing methods, and the development of new standard tests of known accuracy. For the test a reasonable fee is charged, except when made for the National or State Governments.

During the fiscal year 1914 the Bureau made 107,741 tests and inspected 1,078,127 incandescent lamps at various factories for other departments of the Government. Of the total tests 96,687 were for the Government, and 11,054 for the public. The testing was distributed as follows, according to nature of tests: Length measures, 612; mass, 61,176; capacity, 4,000; temperature, 11,010; hydrometry, 1,207; miscellaneous, 74; optical, 1,475; electrical, 724; photometry, 1,883; chemical, 10,543; engineering (miscellaneous), 1,440; engineering (instruments), 277; structural materials, 8,706; paper and textiles, 4,614. The estimated fees amount to \$127,413, of which \$12,989 were collected on account of tests for the public. The fees noted for Government tests are included merely for comparison purposes, as no charge is made for tests performed for the National or State Governments.

2. ENGINEERING AND CONSTRUCTION.

Mechanical Plant.

Since the original installation of the heating and power plant of the Bureau, three large laboratories have been added and a fourth is in process of construction. During this time such special additions have been made to the Bureau plant as space permitted. However, the plant is not only being used to its full capacity, but at certain seasons of the year is greatly overtaxed. It is evident that the completion of the chemical laboratory authorized at the last session of Congress, will necessitate enlargement and remodeling of the power and heating system by the construction of an addition to the present building, or a smaller one detached from it, to provide for additional boiler and power plant space.

The Bureau has also outgrown the capacity of its refrigerating plant originally installed at the establishment of the Bureau. The

necessity for the control of temperature and humidity in many tests and experimental problems, requires the installation of a larger plant at the earliest possible moment. The general condition of the power plant is far too inadequate.

Provision should also be made for the better handling of the mail and express between the Bureau and the city, by the addition of a small auto delivery wagon. The collection of samples of materials to be tested for the various Government bureaus and the delivery of results have been seriously retarded by the lack of such conveyance. This is often a serious matter in connection with the award of contracts or the acceptance of deliveries.

The personnel of the engineering division should be augmented by providing an additional assistant engineer, a fireman, and a laborer.

Construction Facilities.

The care of the mechanical plant, of the buildings, and especially the construction of special apparatus of all kinds, necessitates a corps of mechanics skilled in the various kinds of construction. Every investigation requires the construction of more or less special apparatus involving mechanics skilled in the construction of all kinds of precision instruments. These services include plumbing and steamfitting, electrical wiring, wood working, instrument making, glass blowing, and glass grinding—all are involved in both investigational and testing work. In fact the Bureau's efficiency depends very largely upon having services of this sort available.

Care of Buildings and Grounds.

The care of the buildings of the Bureau has been inadequate for several years. This has been due in part to insufficient janitor service and in part to the lack of continuous supervision of that service. It is hoped that the janitor service may be increased during the coming year and that provision may be made for its proper supervision.

The care of the grounds has become of sufficient importance to warrant the continuous employment of a foreman. The funds available for the care of the grounds have been insufficient to do any grading or to begin the construction of permanent roads. This will be partially taken care of during the coming year.

IV. RECOMMENDATIONS.

Buildings.

Attention is again called to the necessity of properly housing the structural materials work, especially the branch of the work at Pittsburgh, and which is temporarily located in buildings of the War Department at the Arsenal grounds. These buildings are entirely unsuited for the purpose either as to location or character, and the Bureau has considered it unwise to expend any funds on their preparation as laboratories other than the barest necessities. Furthermore, the War Department has repeatedly asked for the vacation of the building.

Every effort is being made by the Bureau to place its structural work on a basis commensurate with its importance. Considerable

heavy equipment has been accumulated both at Pittsburgh and Washington, and more will be needed. Good work is being carried on at both places but the large testing machines, furnaces, and other heavy equipment should be brought together in a building designed for the purpose and sufficiently large to accommodate all heavy equipment of this kind. It is uneconomical and inadvisable to proceed with the installation of permanent heavy equipment in temporary quarters.

Transverse Testing Machine.

Attention is again called to the necessity of adding to the Bureau's equipment a large transverse testing machine capable of testing the transverse strength of full-sized steel girders used in bridges and buildings; also, brick, stone, and concrete arches, floor constructions, etc. The late Alfred Noble, one of the most prominent engineers that America has produced, made the following statement concerning the necessity for the construction of such a machine:

The use of steel and concrete in girders in the construction of bridges and buildings is increasing rapidly. The calculations of strength of such girders are to a large extent based on theory, not well checked by actual tests; such tests as have been made were on small girders, and the value of the results in determining the dimensions of large girders such as are now in common use is doubtful. It is questionable whether, on the one hand, many structures in daily use are not perilously near the breaking point; or, on the other hand, whether the structures are not built unnecessarily massive and costly.

There is therefore great need of a large testing machine for actually testing the strength of girders of large size. Such a machine, operated under the direction of the Bureau of Standards, would soon repay its cost by inducing more economical and safer construction.

Since transmitting the original estimate for this machine, much additional evidence has been secured, all indicating the great need on the part of engineers for data that can only be obtained by a large machine of this character. It is, therefore, recommended that a sufficient sum be again included in the estimates to enable the Bureau of Standards to begin its design and construction.

Radio Laboratory.

Radio communication has recently become of extreme importance both in Government work and to the public. This method of communication is still largely in the experimental stages. Future progress and improvement in radio communication will be in direct proportion to the progress that is made in the knowledge of the underlying scientific principles involved. Several departments of the Government are deeply interested in maintaining this method of communication on the best possible basis. To do this they will each be compelled not only to keep in close touch with the progress of other countries in this respect, but to undertake such scientific and technical investigations as may be necessary. It would not only be more economical, but productive of much more efficient work to concentrate the laboratory work of the Government at one place in a small laboratory especially designed for it. It has been agreed by all of the Departments concerned, namely, War, Navy, Treasury, Post Office, Agriculture, and Commerce, that the location of the laboratory at the Bureau of Standards would prove of great benefit both as to the economical performance of the work and by its close

proximity to the scientific work of the Bureau, especially that of the electrical division. An item of \$50,000 for the construction of a suitable radio laboratory, and another of \$10,000 to enable the Bureau of Standards to carry on that part of the radio work which naturally falls to the Bureau in connection with the radio supervision work of the Department of Commerce, was included in the estimate for the current year, but were not appropriated for. It is recommended that they be again submitted in the estimate for the next fiscal year.

Additional Ground.

The recent opening of Van Ness Street north of the Bureau at a place not adjoining the Bureau's grounds, make it necessary to secure the small strip of land between that street and the north boundary of the Bureau site. Efforts were made without avail to secure the location of the street in a position adjoining the Bureau's property. It is also advisable to secure the narrow strip between the Bureau and Tilden Street on the south.

Additional Scientific Assistance of the Minor Grades.

During the past two years the Bureau's work has grown far more rapidly than its resources. This is especially true in consultation and testing work for the Government. In several sections of the Bureau it has been necessary to suspend all investigations in order to care for the testing of materials purchased on Government contracts. This would not be so serious if suitable specifications and methods of testing were in existence for the wide range of materials to be tested; but it can truly be said that such is the case in only a very limited number of materials. It is felt that this situation can be remedied to a large extent by a reasonable increase in the minor assistants such as apprentices, aids, and assistants up to and including the grade of \$1,400. A few of these men in each section could almost double the Bureau's output of testing, and what is still more important, allow more time on the part of advanced men for the improvement of methods and specifications.

Clerical Services.

The clerical assistance of the Bureau has been entirely inadequate for the past four years. So critical has this become during the past year that it is a serious question as to whether the Bureau is not very materially reducing the efficiency of all branches of its work by the lack of anything like adequate clerical assistance. This is especially true in the case of property records, accounting, files, and correspondence.

Skilled and Unskilled Labor.

The situation of the Bureau is such that it is impractical to secure economical contracts for small jobs of construction. These are continually arising in all kinds of experimental work. Their nature is such that they require the supervision of the experts of the Bureau. It is no uncommon matter when soliciting bids for this class of work to receive them of three or four times the amount necessary. This

is due to the distance of the Bureau from the city, the necessity for the supervision of the work on the part of the contractor, and his hesitation to undertake work of a character unfamiliar to him. It is therefore recommended that the Bureau staff of this class of skilled and unskilled laborers be considerably increased.

Increase of Funds for Special Investigations.

Several of the special funds under which the Bureau is carrying on important work should be increased, namely, structural materials, testing and inspection of large scales, the public-utility fund, and that for the investigation of the fire-resisting properties of materials, and for the investigation of the causes of failure of railway materials.

Standard Materials.

In another part of this report attention is called to the necessity of extending the preparation of standard samples of materials. The Bureau is unable at present to prepare more than a few of the most important. These samples are in great demand by a large number of industries, as well as educational institutions. A special appropriation of not less than \$4,000 should be asked for to provide for the preparation of these samples. It should be kept in mind that these samples are distributed at the cost of production, the greater part of the expense of their preparation being returned to the Treasury.

Investigation of Textiles, Paper, Leather, and Rubber.

The increased tendency on the part of the Government and the public to purchase textiles, paper, leather, and rubber according to specifications and tests, makes it necessary for the Bureau to develop standards of quality and methods of testing. This is especially important in view of the fact that laws and regulations are rapidly being prepared and enacted regarding the branding and quality of these materials, both of which involve standards and methods of testing. An item should therefore be included in the next estimates to cover this work.

Investigation of Clay Products.

The pottery, brick, tile, terra cotta, and other industries engaged in the production of clay products are greatly in need of reliable and authoritative data concerning the properties of these products and the materials which enter into them. In few industries is there any greater opportunity of the improvement by the application of precise measurements and of scientific knowledge of the nature of the products. For this purpose it is recommended that a special fund of \$10,000 be included in the estimates.

Color Standards and Specifications.

The industries engaged in the manufacture of paper, textiles, dairy products, oils, dyes, inks, and many others, are in urgent need of such standards and the methods for their use. A special fund of not less than \$5,000 per year for three or four years would enable the Bureau to take up the more important phases of color work.

Covering for Meter-Testing Tank.

The meter testing tank as constructed is in the open and is not available for use in the winter or bad weather. These and other conditions make it desirable to inclose it by a light inexpensive covering which will protect it and make it available in all kinds of weather.

Repairs and Alterations.

The funds available for repairs and alterations should be increased for repainting the walls of three of the larger buildings, together with the external woodwork.

Respectfully,

S. W. STRATTON, *Director.*

To Hon. WILLIAM C. REDFIELD,
Secretary of Commerce.

REPORT
OF THE
DIRECTOR OF THE CENSUS

363

REPORT OF THE DIRECTOR OF THE CENSUS.

DEPARTMENT OF COMMERCE,
BUREAU OF THE CENSUS,
Washington, October 15, 1914.

SIR: There is submitted herewith the following report upon the operations of the Bureau of the Census during the fiscal year ended June 30, 1914, and upon the work now in progress.

My oath of office was taken on July 1, 1913, so that the period covered by this report is identical with that of my incumbency of the Directorship.

During the fiscal year the Bureau brought to completion the deferred work of the Thirteenth Decennial Census; began various special compilations of Thirteenth Census statistics; commenced and brought well toward completion the preparation of a "statistical atlas," based on data collected at the Thirteenth Census; tabulated and published data relating to the dependent, defective, and delinquent classes; conducted the decennial inquiry on wealth, debt, and taxation; completed its quinquennial canvass of electrical industries and a considerable part of the work of compiling the statistics obtained; began preparations for its quinquennial census of manufactures, the field work for which will commence early in the calendar year 1915; compiled and published the biennial Official Register of the United States; made its regular annual collections and publications of statistics relating to mortality, finances of cities, and production, distribution, and consumption of cotton; completed the annual forest-products inquiry, covering the calendar year 1912, and issued its report thereon; made its semiannual collections and publications of statistics of stocks of leaf tobacco held by manufacturers and dealers; and answered numerous mail requests for information contained in its records.

Since the close of the fiscal year the Bureau has continued its preparations for the coming census of manufactures; has carried on its ordinary routine work; and has issued various publications embodying the results of the inquiries along the lines named in the preceding paragraph, with the exception of those on which work was completed before July 1, 1914.

The publications issued during the fiscal year and since its close are listed in Appendix I.

WORK COMPLETED DURING FISCAL YEAR.**STEPS TAKEN TO EXPEDITE DELAYED WORK.**

On assuming charge of the Bureau I found the Thirteenth Census work still unfinished, and the publication of the results of certain of the annual inquiries considerably in arrears. From the first it has been my earnest desire to bring the work up to date and to keep it in that condition, and my first step toward the attainment of this end was the appointment of a committee consisting of the chief statistician for manufactures, the chief clerk, and the expert special agent in charge of the division of agriculture, to investigate the work in all the divisions of the Bureau and to make recommendations which would lead gradually to a complete reorganization. This committee accumulated a large quantity of material and made a number of recommendations which resulted in great improvement in certain branches of the work.

It also seemed desirable in this undertaking to have the assistance and advice of persons who were outside of the Census Bureau but who were familiar with its work. I accordingly selected for this purpose Hon. S. N. D. North and Hon. W. R. Merriam, former Directors of the Census; Prof. Walter F. Willcox, of Cornell University, who had been a chief statistician in the Bureau during the census of 1900, and who for the greater part of the time since has been connected in some capacity with the work of the office; Mr. W. S. Rossiter, who had been a chief of division and later chief clerk of the Bureau; and Hon. Daniel C. Roper, First Assistant Postmaster General, who had been an expert special agent and chief of division in the Census Bureau. These gentlemen, with the exception of Mr. Roper, were given appointments as expert special agents.

After examining the material and recommendations made by the committee of the regular employees of the office, they conducted an independent investigation of conditions in the Bureau, conferring with the chief statisticians and other officials in charge of the different branches of the work. They found that, while the larger proportion of the work of the Thirteenth Census had been finished and the results published, nevertheless a considerable quantity of the statistical information collected still remained to be tabulated and printed. This had been deferred, along with certain other branches of the work, in order to permit the publication of the balance of the reports at the earliest possible date. The work on some of the annual reports of the Bureau—in particular, Financial Statistics of Cities for 1912 and Mortality Statistics for 1910, 1911, and 1912—was also far in arrears.

The expert special agents advised me that no additional tabulations or analyses should be undertaken in connection with the unfinished branches of the Thirteenth Census work; that the work on these branches and on the delayed annual reports could and should be curtailed so as to insure their publication not later than December 31, 1913; and that the annual compilation of statistics of forest products should be abandoned.

Substantial compliance with these recommendations has been possible; and, furthermore, along a number of lines improvements in methods have been made, with consequent saving in time and ex-

pense, which were not covered by the recommendations, so that greater progress has actually been made during the period to which this report relates than was contemplated by the expert special agents. It gives me pleasure to be able to state that the work of the Bureau of the Census is now in a most gratifying condition. The deferred publications have all been issued; the current inquiries and compilations are progressing smoothly, satisfactorily, and speedily; and thorough and comprehensive preparations are being made for the 1915 census of manufactures.

DEFERRED THIRTEENTH CENSUS WORK.

During the fiscal year Volumes I, II, III, V, VIII, X, and XI of the final reports of the Thirteenth Census were issued. With the exception of Volume I, which was ready for distribution January 5, 1914, all these reports were published before the close of the calendar year 1913. The only report remaining to be issued at the close of the fiscal year was Volume IV, relating to occupations, and this was issued a week later, on July 7, 1914. The bulk of the material for most of these reports was in the hands of the printer before the beginning of the fiscal year, but the proof reading and verification necessarily took considerable time.

Mines and Quarries (Vol. XI).—This report was issued December 30, 1913. Its scope, as originally planned, was considerably curtailed, upon recommendation of the expert special agents,^a in order to avoid greater delay in its publication.

Occupation Statistics (Vol. IV).—This report deserves particular mention. Work on it began in May, 1911, but was suspended in January, 1912, owing to the large reduction in the temporary force at that time. It was resumed in the following September, when temporary clerks were again employed; was suspended early in August, 1913, because of the necessity of providing for the completion of the general report on population; and was again taken up in the latter part of the following month.

This report, although treated as one of the Thirteenth Census publications, partakes more of the nature of the special or "intercensal" reports which the Bureau issues from time to time during the intervals between decennial censuses; and, in fact, at the census of 1900 the occupation report was so treated.

In order that there might be as little delay as possible in the publication of the report on occupations, it was limited to nine general tables, brief explanatory text, and 35 "text tables." The general tables occupied 525 quarto pages, and the text and text tables 74 pages. The total number of pages in the volume is 615. The report was ordered to print in June, and was ready for distribution July 7, 1914. Of the nine general tables included in this publication, the first three present, for the United States, individual States, and principal cities, a distribution, according to number and sex, of gainfully employed persons 10 years of age and over among 428 occupation groups and subgroups. The fourth and fifth tables give, for the smaller cities and for the outlying territories, a similar distribution among 215 occupation groups and subgroups. The sixth

^a See p. 366.

table, relating to the United States only, gives a distribution, according to sex, color, and age groups, of gainfully employed persons 10 years of age and over among specific occupations in detail under each of 129 general industry or service groups. The three remaining tables give, for each State, each principal city, and each of the three outlying Territories, a similar distribution, according to color and age periods, of males and females engaged in the principal or leading occupation groups.

A bulletin on occupations, covering 106 pages, was also prepared. This bulletin, which was issued August 14, 1914, is a summary of the statistics presented in the detailed report, including the first two general tables. In order to enable the Bureau to comply with the numerous requests received by it for occupation statistics, reprints also have been made of the two general tables containing data for the larger and smaller cities of the country, and of the two general tables relating to Alaska, Hawaii, and Porto Rico.

Abstract supplements and bulletins.—In addition to the reports already named, there were issued during the fiscal year three editions of the Abstract of the Census, with supplements for Alaska, Hawaii, and Porto Rico, respectively; 16 reprints, in bulletin form, of chapters in Volume I (Population—General Report and Analysis); 12 reprints, in bulletin form, of chapters in Volume V (Agriculture—General Report and Analysis); 1 reprint, in bulletin form, of a chapter and table in Volume VIII (Manufactures—General Report and Analysis); 38 bulletins on manufacturing industries, which later formed sections of Volume X (Manufactures—Reports for Principal Industries); 2 reprints, in bulletin form, of sections of Volume X, each relating to a group of industries; 1 reprint, in bulletin form, of a section of Volume X relating to manufactures in metropolitan districts; 1 bulletin relating to iron mines, which later formed a section of Volume XI (Mines and Quarries); and 1 special bulletin, Stability of Farm Operators, or Term of Occupancy of Farms, showing, for white and colored farmers separately, by character of tenure, the length of the average period of occupancy of farms. Another special bulletin, Age of Farmers, by Color of Operator, Character of Tenure, and Size of Farm, was prepared during the fiscal year and issued shortly after its close. This bulletin, which is the first of its kind ever issued by the Census Bureau, analyzes the relationship existing between the age of the farmer, on the one hand, and his color, the character of his tenure, and the size of the farm operated by him, on the other hand.

VITAL STATISTICS.

The annual reports on mortality statistics, relating to the calendar years 1910, 1911, and 1912, were issued on October 2, 1913, December 17, 1913, and January 5, 1914, respectively. These reports, and particularly those for 1910 and 1911, had been delayed because of the pressure of the Thirteenth Census work. In order to expedite the publication of the 1912 report, the tables giving the detailed death rates were omitted. These rates will be included in the 1913 report.

On July 1, 1913, 260,956 deaths had been reported for the calendar year 1913. The editing was begun in the following December; and the editing, punching, and machine tabulation for the total of 890,848

deaths reported for the year were completed during the last week in June, 1914.

During the fiscal year the States of Georgia and South Carolina passed satisfactory death-registration laws, based upon the "model law" recommended by the Bureau of the Census. The enactment of this legislation was due in large part to the efforts of the Bureau.^a

STATISTICS OF CITIES.

The report on general statistics of cities for 1909, a quarto volume of 197 pages, was in page proof on June 30, 1913, and was issued soon thereafter. Up to 1909 this report had been issued biennially, but, owing to the necessity for concentrating the force of the office so far as possible on the work of the Thirteenth Census, the report for that year was considerably delayed, and it was decided not to issue it at all for 1911 and 1913. The annual reports on financial statistics of cities, however, carry a few statistics of a general character.

The 1911 report on Financial Statistics of Cities Having a Population of 30,000 and Over, containing 401 pages, was completed November 15, 1913, and was ready for distribution December 8.

The special agents appointed to devise methods of expediting the delayed census work^b recommended that the 1912 and 1913 reports on Financial Statistics of Cities Having a Population of 30,000 and Over be issued only in bulletin form, with no more text than was necessary for explanation and definition. The 1912 bulletin was completed December 15, 1913, and was ready for distribution seven days later. After the issuance of this bulletin it was found practicable to publish the regular report for 1912. This publication, a quarto volume of 410 pages, was ready for distribution June 6, 1914.

The 1913 report was completed during the fiscal year ended June 30, 1914, and copy transmitted to the printer. This publication was issued in the form of a quarto bulletin of 73 pages, and was ready for distribution September 14, 1914.

OFFICIAL REGISTER OF THE UNITED STATES.^c

This publication, a quarto volume of 876 pages, was compiled during the first half of the fiscal year, and was ready for distribution January 7, 1914. As a result of suggestions made by the Department of Commerce, upon the recommendation of the Census Bureau, the urgent deficiency bill approved October 22, 1913, provided for the discontinuance of the publication of Volume II of the Official Register, relating to the Postal Service. The bill also provided for the omission of the list of ships and vessels belonging to the United States, formerly included in Volume I.

This legislation greatly simplified the preparation of the Official Register and very materially decreased the expense of the work (the cost of compiling and printing Volume II being estimated at \$20,000).

^a For present status of vital-statistics work, see p. 373.

^b See p. 366.

^c See also pp. 380 and 384.

DEPENDENT, DEFECTIVE, AND DELINQUENT CLASSES.

Under this heading come the Bureau's decennial reports on benevolent institutions, paupers in almshouses, the insane and feeble-minded in institutions, prisoners and juvenile delinquents, and the blind and the deaf and dumb. The statistics for these reports are obtained, except in the case of those for the blind and deaf,^a by correspondence with officials of the institutions canvassed.

Three bulletins, relating, respectively, to the insane and feeble-minded in institutions, to paupers in almshouses, and to prisoners and juvenile delinquents, were published during the fiscal year. Final reports on these classes will be issued later.^b

Benevolent Institutions, 1910.—This report, a quarto volume of 411 pages, including explanatory text and "text tables," was published early in January, 1914. A second edition was called for and printed, with some revisions, in June, 1914.

COTTON AND TOBACCO.

During the fiscal year the Bureau conducted its regular inquiries relating to cotton and tobacco. These investigations are discussed on pages 374 to 376.

FOREST PRODUCTS.

The annual collection of statistics of forest products was inaugurated in 1906, in accordance with an order of the Secretary of Commerce and Labor, on the initiative of the Forest Service of the Department of Agriculture. The inquiry, although never directly or indirectly authorized by Congress, was continued by the Bureau of the Census, in cooperation with the Forest Service, from 1906 until 1912, when it was abandoned by the Census Bureau upon the recommendation of the expert special agents referred to on page 366. This recommendation was as follows:

That the annual compilation of the statistics of forest products be abandoned. There appears to be no authority of law for an annual inquiry of this character, which the records show to have cost from \$20,000 to \$40,000 a year.

In view of the importance of these statistics and of the demand for them from large consumers of forest products and others interested in the conservation of natural resources, the Forest Service undertook the task of collecting the data for 1913. It has been decided that the Bureau of the Census collect the figures for 1914 in connection with its regular quinquennial census of manufactures, which will cover that year; and an effort will be made to secure the passage of an act of Congress authorizing the Bureau, in cooperation with the Forest Service, to continue the annual collection of these statistics. A draft of such an act has been submitted to the Secretary of Agriculture and has been examined by him, approved, and returned with a few changes. The Secretary of Commerce has sent a copy of this draft to the chairman of the House Committee on the Census, with the recommendation that it be enacted into law. If this recommendation is complied with, duplication in the collection of the statistics will be avoided and it will be possible to utilize to the best advantage the services of the technical employees of the two Departments.

^a See p. 377.

^b See pp. 376 and 377.

The work done during the fiscal year consisted in the completion of the canvass covering the calendar year 1912, the compilation of the results, and the preparation of the report, an octavo pamphlet of 60 pages, which was issued February 7, 1914.

STATISTICAL ATLAS.

The Statistical Atlas of the United States was prepared and the great bulk of the copy sent to the printer before the beginning of the present fiscal year. It will be ready for distribution in November, 1914. This publication is a quarto volume containing 99 pages of text and 503 plates carrying maps and diagrams presenting graphically the more important facts brought out by the various decennial and other census inquiries. The current Statistical Atlas covers the subjects of population, agriculture, manufactures, mines and quarries, cotton production and consumption, financial statistics of cities, vital statistics, religious bodies, marriage and divorce, and insane in hospitals. The purpose of this volume is the presentation of the more significant statistics collected by the Bureau of the Census in such form that they may be readily grasped and understood.

In connection with the preparation of this publication, computations were made to determine, for the United States as a whole, the location of the "centers" of Negro and foreign-born white population, of urban and rural population, and of the value of all farm property. In addition, the center of population of each of the States of the United States was determined for each census from 1880 to and including 1910, and a series of State maps has been presented in the Statistical Atlas showing the location of these centers. This is the first time such a series of maps has been included in a census report.

ESTIMATES OF POPULATION.

During the years intervening between the decennial-census periods the Bureau of the Census prepares estimates of population, based on the returns of the last preceding census and the rates of growth during the period between the last two censuses. Such estimates, projected forward from 1910 to 1914, through each of the intervening years, inclusive, for the States, and for cities which had in 1910 a population of 8,000 or over, were computed during the fiscal year and published in Bulletin No. 122, issued in March, 1914. These estimates are used not only for general statistical purposes but also by health officers of the various cities for the purpose of computing death rates for intercensal years.

The Bureau has also prepared estimates of population for a number of townships, cities, and villages for the Ohio State Liquor Licensing Board.

CURRENT WORK.

WEALTH, DEBT, AND TAXATION.

This is one of the most important of the Bureau's "intercensal" inquiries. A portion of the data for the current series of bulletins, which relate to the fiscal year ended June 30, 1913, were obtained from printed reports of the Federal Government and of States, cities, and counties; the remainder were gathered by personal canvass. The

office work on this investigation was commenced in October, 1913. The field work began March 21, 1914, and during the period from that date to June 30, 1914, the employees in the field numbered, on the average, 86.

Work is progressing rapidly and satisfactorily on this inquiry. Two bulletins—"National and State Indebtedness and Funds and Investments" and "Taxation and Revenue Systems of State and Local Governments"—have been issued since the close of the fiscal year 1914; another, "National and State Revenues and Expenditures, 1913 and 1903, and Public Properties of States, 1913," will come from the press in a short time; and four more—"County and Municipal Indebtedness, 1913, 1902, and 1890, and Sinking Fund Assets, 1913," "County Revenues, Expenditures, and Public Properties, 1913," "Municipal Revenues, Expenditures, and Public Properties, 1913," and "Assessed Valuation of Property and Amounts and Rates of Levy, 1860-1912"—will be issued late in 1914 or early in 1915. The final bulletin, "Abstract—Wealth, Debt, and Taxation," will contain an abstract of the statistics presented in the seven bulletins just named, together with an estimate of the true value of all property in the United States, both subject to and exempt from taxation. This final bulletin will be issued early in 1915—about a year and a half from the commencement of the office work and about a year from the commencement of the field work. In this connection it may be stated that the field work on the last preceding inquiry on this subject was commenced March 1, 1903; that two bulletins, relating to municipalities, were issued August 31, 1905, and July 12, 1906, respectively; and that the complete report was ready for distribution May 7, 1907, more than four years from the beginning of the field work. No data are available from which to make anything like an exact comparison of the two investigations with respect to cost; but there has been a very material saving in this respect, due in large part to the fact that some 15 or 20 per cent of the statistics collected at the present inquiry were obtained from published reports of the various governmental units, the work being done in the office at Washington instead of by personal canvass in the field.

ELECTRICAL INDUSTRIES.

Statistics of electrical industries are collected quinquennially by this Bureau. The current inquiry relates to the calendar year 1912. The field work for this census was begun in January, 1913, and was completed in November of the same year, there being, on the average, 27 clerks employed in the field during this time. Press summaries of the statistics were issued from time to time as the tabulation progressed, beginning in December, 1913; and two bulletins were issued, in May and June, 1914, respectively, the first presenting the principal data in regard to telephones and telegraphs and the second giving the more important statistics relating to central electric light and power stations and street and electric railways. The final reports will be issued late in 1914 or early in 1915, in the form of two quarto volumes. One, entitled "Central Electric Light and Power Stations, and Street and Electric Railways," and comprising nearly 600 pages, will include in more detailed form the statistics contained in the bulletin under the same name. The other, entitled "Telephones and Telegraphs," and comprising about 250 pages, will

contain in amplified form the data given in the bulletin on telephones and telegraphs, together with a section showing telephone rates throughout the United States. Statistics relating to municipal electric fire-alarm and police-patrol signaling systems will also be included. Comparative statistics will be given, covering two five-year periods (1902-1907 and 1907-1912), thus bringing out definitely and clearly the enormous growth of electrical industries during the past decade.

The preparation of these reports has been finished, and the complete copy was sent to the printer during the month of August. I am glad to be able to state that the copy for these bulletins and the final reports has been sent to the printer at relatively much earlier dates than was the copy for the corresponding publications relating to the census of electrical industries for 1907.

VITAL STATISTICS.

The vital-statistics work done during the fiscal year 1913-14 is discussed on pages 368 and 369.

The preparation of the report on mortality statistics for the calendar year 1913 is now nearly completed. The copy has already been sent to the printer, and some of the proof has been received and read. The report will contain more than 600 pages, and will include summary and rate tables for 1912, which were omitted from the report for that year.* In this report will be included, for the first time, mortality statistics for the State of Virginia, which has recently been added to the death-registration area.

The Index of Joint Causes of Death, intended for the use of registrars of mortality statistics, showing the assignment to the preferred title of the International List of Causes of Death when two or more causes are simultaneously reported, has recently been issued. This publication, an octavo volume of 308 pages, has been "printed as proof," in order to enlist constructive criticism from registrars and others concerned or interested in the recording, transcription, compilation, and publication of mortality data.

An important piece of work now in progress is the preparation of a series of life, or mortality, tables, based on the population and mortality statistics of 1900 and 1910, showing "expectation of life" for various elements of the population—male and female, white, Negro, urban, rural, etc.—in the original registration States (Connecticut, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and the District of Columbia) as they existed in 1900, taken as a group. Certain of these States, ranking high in population, such as New York, Massachusetts, Michigan, Indiana, and New Jersey, will also be represented individually. These tables are similar to those used by life insurance companies, and their preparation, which is under the charge of Prof. James W. Glover, of the University of Michigan, involves actuarial computation of an intricate character. This is the first time that life tables of such an extensive nature have been published by any Federal or State bureau.

Constant effort is being made to bring these reports to a higher standard of usefulness, both to the professional and scientific classes

* See p. 368.

and to the public in general. Separate statistics are now shown with reference to the white and colored races for all localities in the registration area which had at least 10 per cent of their population colored in 1910 (that is, for all such localities in the South), and for all municipalities having a total colored population of at least 10,000 in 1910 (that is, for all cities of considerable size in any part of the country).

In preparing the report for 1914, data for deaths of nonresidents will be shown separately, so far as it is possible to do so, thus avoiding the injustice which is now done certain cities for which high death rates, due in considerable part to deaths of nonresidents, are shown. This is particularly the case with respect to cities having unusually healthful climates, by reason of which consumptives and other invalids are attracted thither, and with respect to cities as compared with rural localities, since an appreciable percentage of the deaths in city hospitals are of persons resident in near-by small towns and rural territory.

COTTON AND COTTONSEED.

The Bureau collects and publishes each year statistics relating to cotton ginned, to cotton consumed, imported, exported, and on hand, and active cotton spindles, and to cottonseed and linters. There are now 10 reports on cotton ginned issued during each crop year, beginning with that relating to August 31 and ending with that for February 28. Each of these reports shows the season's ginnings up to the date to which it relates, the last one summarizing the output for the entire cotton year. The reports on stocks held and consumption of raw cotton by warehouses, mills, etc., are published monthly during the entire year. Three reports on cottonseed crushed and linters obtained are issued each year, the first relating to November 30, the second to December 31, and the third, covering the season's crush, to February 28. These reports are all distributed in card form.

In no other line of the Bureau's work is promptness of publication so important a factor as in the case of these cotton reports, and it is gratifying to be able to state that the ginning reports are published only eight days after the dates to which they relate. One week is allowed the agents in the field in which to make their canvass, and only one day more is consumed at the Bureau of the Census in getting the figures ready to give out. The reports on stocks and consumption are issued approximately 14 days, and those on cottonseed and linters approximately 16 days, after the dates to which they relate.

The Bureau also publishes annually two quarto bulletins, one relating to production of cotton, cottonseed, and cottonseed products, with condensed data relating to supply and distribution of cotton, and the other giving more detailed statistics of supply and distribution of cotton, together with data regarding active cotton spindles and exports and imports of raw cotton and its manufactures. The bulletin on the production of cotton and cottonseed products, relating to the crop of 1913, comprised 79 quarto pages, and was issued in July, 1914. The bulletin on supply and distribution of cotton for

the year ended August 31, 1914, will be issued at an early date and will contain approximately 40 quarto pages.

The chief statistician for manufactures, who has charge of the cotton work, visited, while on his vacation in England, a number of the correspondents of the Bureau and made arrangements for more satisfactory reports concerning the production and consumption of cotton in foreign countries.

It has been my desire to make such changes in the present system of collecting and publishing cotton statistics as will enable the Bureau to avoid the necessity for publishing annually two bulletins, one dealing with the production, which covers the crop year and is distributed about June 30, and the other covering the supply and distribution for the commercial cotton year ending August 31, which is distributed about October 31. The greatly increased use of fertilizers, which hastens the maturity of the crop, together with the extension of cotton cultivation in southern Texas, has resulted in placing on the market a larger quantity of new-crop cotton than formerly, prior to the termination of the commercial year. This is a disturbing factor in arriving at the quantity covered by the report on supply and distribution, and many have been advocating a change in the cotton year. Action on the matter was taken by the cotton convention held at Augusta, Ga., in May, 1914, where representatives of the American cotton exchanges passed a resolution making the cotton year end on July 31, and the reports of the cotton movement are now made up accordingly. In England the cotton organizations also prefer to have the commercial year end July 31, rather than June 30, if any change is made. The fixing of this year, however, would be less advantageous to the work of the Bureau than would the adoption of a fiscal year ending June 30.

In view of the facts stated in the preceding paragraph, I have given instructions that after this year only one annual cotton bulletin shall be compiled. This bulletin will relate both to the production and to the supply and distribution of cotton, and will be ready for distribution about September 15. As already stated, the final report of the preliminary series relating to ginning, which is issued about March 8, shows the total season's ginnings. This report is supplemented by a summary showing the ginnings by counties. The placing of all the information collected by the Bureau in one annual publication will make reference much easier than if two bulletins were to be compiled.

TOBACCO.

Under authority of an act of Congress approved in April, 1912, the Bureau makes semiannual collections and publications of statistics of stocks of leaf tobacco held by manufacturers and dealers. The reports for the fiscal year 1914 relate to October 1, 1913, and April 1, 1914, and were issued, in card form, November 13, 1913, and May 9, 1914, respectively. The preliminary work on the report for October 1, 1914, has been finished, and the schedules used for collecting the statistics were mailed on September 19 to the various manufacturers and dealers whose duty it is to make the returns.

These statistics are collected almost entirely by correspondence, but the Bureau of Internal Revenue of the Treasury Department

renders valuable assistance in correcting the reports and in obtaining returns from establishments which fail to respond promptly to the inquiries of the Bureau of the Census.

A special effort is made to publish the figures as soon as possible after the date to which they refer, and it is gratifying to note that each report since the inauguration of this work has been issued more promptly than the preceding one. In fact, the last report, relating to April 1, 1914, was ready for distribution in only two-thirds the time required for the preparation and publication of the first one, relating to October 1, 1912.

In July, 1914, five representative tobacco planters, dealers, and manufacturers, each a resident of a separate tobacco-growing State, were given appointments as expert special agents and called to Washington for the purpose of discussing improvements in the method of collecting these statistics. Their report has been printed, and copies of it have been sent to Senators and Representatives and to the establishments from which the statistics are obtained. It is my intention to hold a similar meeting of these special agents immediately after the publication of the forthcoming semiannual report, in order that they may examine and criticize the statistics and suggest such further changes in the work as may seem desirable. It is expected that substantial benefit will result from the adoption of some of the suggestions made by these tobacco experts.

In addition, correspondence has been carried on with the leading tobaccoists of the country for the purpose of obtaining suggestions of better methods of collecting and publishing the statistics. In short, while the Bureau's tobacco reports have been generally approved by those interested and have received but little adverse criticism, everything possible is being done to increase their usefulness.

DEPENDENT, DEFECTIVE, AND DELINQUENT CLASSES.

The work done on the inquiries relating to the dependent, defective, and delinquent classes during the fiscal year 1914 has already been described in the section relating to the work completed during that year.^a As stated in that section, the Bureau issued during the fiscal year three bulletins, relating, respectively, to the insane and feeble-minded in institutions, to paupers in almshouses, and to prisoners and juvenile delinquents. These bulletins, which were prepared in accordance with the recommendations of the expert special agents^b who were appointed to devise methods of expediting the delayed census work, contained the general tables presenting the fundamental data, but included no derivative tables, percentages, or explanatory text. Final reports on the insane and feeble-minded and on paupers have since been prepared, and a report on prisoners and juvenile delinquents is now in course of preparation.

These reports will be more complete and comprehensive in scope than any which the Bureau has previously published on these subjects. The report on the insane in particular, which has been submitted in proof to well-known authorities on insanity, has been commended as representing a marked advance in the statistical treatment of that subject.

^a See p. 370.

^b See p. 366.

Paupers in almshouses.—The final report on this class, containing, in addition to the general tables already published in the bulletin above referred to, analytical tables and interpretative text, is now in the hands of the printer and will probably be ready for distribution early in 1915.

Insane and feeble-minded in institutions.—The final report on the insane and feeble-minded in institutions contains, in addition to the general tables already published in the bulletin above referred to, analytical tables and a text discussion of the statistics, together with a comparative summary of the principal features of the various State laws relating to the insane. This is now in the hands of the printer, and will probably be ready for distribution some time in December, 1914.

Prisoners and juvenile delinquents.—The final report on this class will include, in addition to the general tables already published in the preliminary bulletin, detailed data relative to prisoners committed during the year 1910, together with analytical tables and interpretative text. It is expected that the tabulation work for this report will be finished late this fall and that the report will be published toward the close of the present fiscal year.

The blind and the deaf and dumb.—The statistics for the reports on these classes were collected by correspondence directly with the individuals themselves, whose names were obtained from the population schedules of the Thirteenth Census. Early in 1914 work on these reports, which, owing to the pressure of other work, had been practically suspended since January, 1912, was actively resumed. All the preliminary work necessary in preparation for tabulation has been completed for the blind population, and the statistics are now being tabulated, while much of the preliminary work with reference to the deaf and dumb population has also been completed. It is expected that the reports on these two classes of the population will be ready for publication toward the close of the present fiscal year.

Summary of laws relating to the dependent classes.—To supply material for a better understanding and interpretation of the statistics relating to the dependent and defective classes, a summary of the State laws relating to the care of these classes, in force in 1913, has been prepared and published, in an octavo volume of 346 pages.

SPECIAL COMPILATIONS OF THIRTEENTH CENSUS STATISTICS.

After the completion of the work of a decennial census, the Bureau makes various special compilations of the statistics collected at that census which it would not be feasible to include in the regular reports. Such compilations of Thirteenth Census material include a report on Indians; supplementary occupation statistics; bulletins on Chinese and Japanese in the United States, the stability of the agricultural population, and ages of farmers; and a report and bulletin on Negroes in the United States.

Indian report.—Work on this report, which is largely based upon data obtained from the special Indian schedule used at the Thirteenth Census, was discontinued in February, 1912, because of the large reduction in the Thirteenth Census force, and was not resumed until the close of April, 1914. In June, 1913, the Bureau issued a

bulletin based on the compilations already made, in which the Indian population was classified according to stock, tribe, blood (full or mixed), sex, age, fecundity, and vitality.

The tabulations, except with respect to occupations, were substantially completed prior to the suspension of the work in February, 1912, and the more recent work has consisted largely of the examination and verification of the tabulated results and the preparation of the general tables and textual matter. Considerable revision and rearrangement, however, have been necessary in order to make the presentations for the several subjects harmonious with one another, so far as necessary and practicable. The work was well in hand at the close of the fiscal year and was substantially completed in July, 1914, except for the employment in August and part of September of a few clerks in final verification and some additional percentage work. All the tables and text for the report are completed, and the copy has gone to the printer.

The special report on Indians, which will occupy a bound volume of several hundred pages, covers 12 subjects—population, stock and tribe, blood, sex, age, marital condition, school attendance, illiteracy, inability to speak English, occupations, fecundity and vitality, and Indians not taxed.

Supplementary occupation statistics.—Work is now under way on a special report presenting supplementary occupation statistics. This report will include the following subjects: Distribution of all persons occupied, by sex, according to color or race, nativity, and parentage, and age periods in detail; occupations of women; occupations of children; occupations of foreign-born workers according to country of birth; occupations according to class of worker; and unemployment data for wage workers only.

These supplementary statistics are based on the second "run" of the occupation cards through the tabulating machines, which is made for each of 428 occupation groups and subgroups, for each State as a whole and for each city of 100,000 inhabitants or more. This work was suspended from May 29 until July 17, 1914, on account of the removal of the Bureau of the Census to the new Department of Commerce Building. On the latter date one machine was made ready, and from time to time thereafter additional machines were installed, until on September 9 eight machines in all (six automatic and two semiautomatic) were in operation on this work. At present about one-third of the total of nearly 39,000,000 cards have been put through the machines on the second run.

Chinese and Japanese.—The Bureau has just issued a 50-page bulletin in which are brought together practically all the statistics regarding Chinese and Japanese in the United States which are found in the Thirteenth Census reports on population (including occupations) and agriculture. A large part of this material has been previously published in the population volumes of the Thirteenth Census and in the bulletins for individual States. The agricultural statistics, however, are practically all published here for the first time, since the previous publications gave only the numbers of Chinese and Japanese farmers.

There has been a great demand for this bulletin from the Pacific Coast and Rocky Mountain States.

Agricultural bulletins.—Two special bulletins relating to the agricultural population have been issued.* Another, *Plantation Systems of Conducting Agriculture in the Southern States*, presenting an amplification of the material contained in Chapter XII, Volume V, Reports of the Thirteenth Census, is in course of preparation and will be issued early in the calendar year 1915. This chapter has been reprinted in bulletin form under the title "Plantations in the South."

Negroes.—Early in August, 1914, the Bureau began the preparation of a special report relating to Negroes in the United States. A preliminary bulletin will soon be issued, and it is expected that the complete report will be published about March 1, 1915. It will show, for the Negro race, the principal census data relating to population, occupations, agriculture, mortality, membership in religious bodies, and marriage and divorce. The figures are being compiled from census publications or other material already in possession of the Bureau. A similar report, based on the census of 1900, was one of the most popular of the Bureau's publications.

INFORMATION FURNISHED BY CORRESPONDENCE.

In addition to the collection and publication of statistics along the various lines already mentioned, the Bureau handles numerous requests from local governments and from individuals for information of one kind and another. More than 1,200 such requests for population data alone were received and answered during the fiscal year. In all nearly 24,000 requests for Thirteenth Census population data have been received to date, of which about 23,000 have been complied with in full. A great many requests are also received for genealogical data and for transcripts of census records regarding ages of soldiers, to be used in connection with applications for pensions or increases of pensions.

The demands for information relating to ages of soldiers are now so numerous that it has become impracticable for the Bureau of the Census to assign a sufficiently large force of its own clerks to this work to enable it to furnish the information promptly. The Commissioner of Pensions, therefore, has from time to time detailed clerks from his bureau. At one period during the past fiscal year the number of clerks so detailed was as high as 42; at present 8 such employees of the Bureau of Pensions are engaged on this work.

PLANS FOR FUTURE WORK.

CENSUS OF MANUFACTURES.

This census, the field work for which will begin early in 1915, will relate to the calendar year 1914. Preliminary work, consisting largely in the preparation of index cards for listing the manufacturing establishments, was commenced in December, 1913, and will continue throughout the present calendar year. A special effort—which, it is expected, will be attended by a large measure of success—is being made to unify the Census Bureau's classifications with those

* See p. 368.

of the Bureau of Foreign and Domestic Commerce, in order to make possible a closer approach to complete comparability of the former Bureau's statistics of manufactures and the latter's statistics of exports and imports.

Another feature of the preparatory arrangements for this census, and one which distinguishes it from preceding censuses, is the effort that has been made to secure the cooperation and assistance of prominent manufacturers and of representative commercial and trade bodies of all kinds. Letters have been written to such manufacturers and to all such organizations of which the Bureau has any knowledge, inviting cooperation and requesting suggestions, particularly in reference to the inquiries carried on the various special or supplementary schedules. A trip was made during January, 1914, by the Director and the chief statistician for manufactures, to Philadelphia, New York, and Boston, where conferences were held with the leading commercial and industrial organizations of those cities with very gratifying results; and a similar trip through the eastern North Central States, extending as far south and west as St. Louis, has been arranged for the latter part of 1914, from which equally satisfactory results are anticipated. Conferences have also been held in Washington with associations and manufacturers, and the forms have already been agreed upon for a large proportion of the schedules. Many of these organizations have, at the request of the Bureau of the Census, passed resolutions to the effect that they recognize the importance of the census of manufactures and will endeavor in every way possible to assist in and expedite the work.

The aid of Members of the Senate and House of Representatives, of the Department of Agriculture, of the Bureau of Corporations, and of State statistical organizations has also been enlisted.

In short, more has been done already, and will be done, in these directions in preparation for the census of 1915 than has been undertaken in connection with any preceding census of manufactures; and it is confidently expected that the results will be published more promptly and will be of greater value than ever before.

CENSUS OF AGRICULTURE.

The Thirteenth Census act, passed in 1909, provided for a census of agriculture, to be taken in 1915 and at 10-year intervals thereafter. This intercensal inquiry will be much more limited in scope than the agricultural inquiry made in connection with each decennial census of population. Estimates for the appropriation needed will be submitted to Congress at its next regular session, together with requests for such slight changes in regard to date of enumeration, scope, and method, as may seem desirable at that time.

STATISTICS OF FEDERAL EMPLOYEES.

The Bureau has under consideration the compilation of statistics of the executive civil service similar in scope to those in Bulletin 94, Statistics of Employees: Executive Civil Service of the United States: 1907. This work could be taken up in connection with the preparation of the next edition of the Official Register, which will relate to July 1, 1915, and the results could be published in bulletin form after the issuance of the Register. In this bulletin the em-

ployees of the executive civil service, exclusive of postmasters and certain other specified employees, would be classified according to sex, race and nativity, age, marital condition, character of appointment with reference to the civil-service rules, character of work, period of service, compensation, State, Territory, or District from which appointed, and military or naval service.

There is a considerable demand for statistics of this nature, which are not now available in any Government publication. The extra data needed for their compilation could be obtained from the departments and independent offices, in connection with the preparation of the Official Register, at a comparatively small increase of expense; and it is believed that their usefulness would furnish ample justification for undertaking the work.*

PUBLICATIONS ISSUED.

The publications issued during the fiscal year and since its close are shown in Appendix I.

COST OF PRINTING AND METHOD OF DISTRIBUTING THIRTEENTH CENSUS REPORTS.

The cost of completing the printing of the Thirteenth Census publications according to the plan originally adopted has been kept within the amount (\$272,000) provided in the legislative, executive, and judicial appropriation bill for 1913, which amount was based on an estimate made in February, 1912. The total cost of printing the Thirteenth Census publications was \$575,439.73, as compared with an approximate cost of \$820,000 for printing the results of the Twelfth Census. In my last annual report (pp. 26 and 27) is given a somewhat more detailed statement of the comparative printing cost of the two censuses, together with a brief description of the methods of publishing and distributing their results.

There has been a constant demand for the Abstract and for the various bulletins of the Thirteenth Census, but the requests for the final reports have been much more limited in number, the careful distribution scheme adopted by the Bureau when the reports were being issued having so placed them that they are in possession of or accessible to those who are interested in all details of the subjects covered by the census, while the comparatively inexpensive Abstract and the still less expensive bulletins furnish information which will comply with the great majority of requests. The Abstract, a quarto volume, containing, exclusive of its supplement, 569 pages, was issued in 53 editions, one without supplement and each of the others including a supplement giving full and detailed statistics, relating to population, agriculture, manufactures, and mines and quarries, for some one State or for the District of Columbia, Alaska, Hawaii, or Porto Rico. A more detailed description of the Abstract was given in my last report (pp. 7 and 8).

The entire contents of Volumes I, II, III, V, VI, VII, IX, and X, and portions of the contents of Volumes IV, VIII, and XI, of the final reports have been issued in the form of preliminary bulletins or of reprints, so that very nearly all the information collected and

* See p. 384.

published at the Thirteenth Census is available for general distribution at trifling expense.

In all there have been issued, in addition to the 11 volumes constituting the final reports, 53 editions of the Abstract, 52 separate editions of Abstract supplements, and 379 preliminary bulletins and reprints.

It is feared that the provision in the sundry civil appropriation bill for the current fiscal year, prohibiting the use of any of the Department's printing appropriation for the printing or binding of Thirteenth Census bulletins or reports, will embarrass the Bureau. The editions of several of the most popular of its bulletins are rapidly becoming exhausted; but, since the specific appropriation for printing and binding the results of the Thirteenth Census has all been spent, reprints can not, under the law, be ordered, though their cost would be small, as all of the matter is in plates at the Government Printing Office, so that the only expense would be for press-work and binding. Elsewhere* I am recommending the incorporation in the next urgent deficiency bill of a provision authorizing the payment from the Department's printing appropriation of the cost of making necessary reprints of Thirteenth Census publications.

OFFICE FORCE.

The appropriation act for the fiscal year 1914 provided for 621 permanent employees of the Bureau of the Census; the number provided by the act for 1915 was 589. This reduction, with the consequent material decrease of expense, was due to the removal of the Bureau to the new Department of Commerce Building and the consequent consolidation of its subclerical or labor force with that of the Department.

No material change has been made in the size of the administrative and clerical force, but very considerable rearrangements of this force have been made in order to provide for the change in the character of the Bureau's current work. In view of the near approach of the 1915 census of manufactures, a very great augmentation of the force of the manufactures division has been necessary, and clerks have accordingly been transferred to that division from other parts of the office, particularly the population division. This transfer will delay the latter division somewhat in getting out the various special compilations of Thirteenth Census statistics on which it is now engaged and will prevent it from taking up other such special compilations which would be of value to statisticians, students, and economists; but it has been my policy from the beginning not to allow work of this character to delay that on the major census inquiries, of which the manufactures census is the most important one conducted during the intercensal period. On pages 379 and 380 is given a statement of the preparations being made for taking this census.

Two important changes have been made in the organization of the force. The first, which took effect January 16, 1914, consisted in the consolidation of the division of revision and results and the division of publication, the name of the former being retained as that of the combined division. The division of publication had been organ-

* See p. 385.

ized for the purpose of looking after the printing of the Thirteenth Census reports and bulletins, and, this work having been accomplished, the necessity for its separate maintenance ceased to exist. At the same time a considerable portion of the force of the former division of revision and results, which had been engaged in editing, proof reading, and checking, was given constructive work to do, so that the division is now a producing, not merely an editorial, branch of the office.

The second change in the organization of the office, which took effect July 1, 1914, was the consolidation of the division of statistics of cities with the division of agriculture, the name of the former being retained. The work of the division of agriculture was practically finished when the agricultural reports of the Thirteenth Census had been issued, and for some time prior to the consolidation the personnel of this division had been employed on work in connection with the wealth, debt, and taxation inquiry, which is under the charge of the chief statistician for statistics of cities.

These changes have all been in the interest of economy and efficiency; and what may be termed the major work of the office has not been allowed to suffer by reason of the employment of an unduly large proportion of the force upon the minor work.

In Appendix II are shown the nature and distribution of the Bureau's office and field force on September 30, 1914.

MECHANICAL LABORATORY.

Operations in the mechanical laboratory during the census year and since its close have been as follows:

Maintenance of tabulating machines (seven automatic and four semiautomatic) for the completion of the first run of the occupation cards; design and partial completion of a new type of automatic tabulator and accessories; equipment and maintenance of machines for the second run of the occupation cards; reestablishment of laboratory equipment in new quarters; equipment and maintenance of tabulating machines for the division of vital statistics; equipment and maintenance of machines for the division of revision and results; maintenance of the tabulating equipment of the Bureau of Immigration and its reestablishment in new quarters; and repairs in general.

Several features embodied in the new model tabulator have been put to practical test with highly satisfactory results as to both output and maintenance.

The great gain in economy and efficiency due to the work of the mechanical laboratory—a gain which, as in the case of practically all successful work in mechanical development, far outweighs the monetary outlay which made it possible—will appear at future decennial censuses in much greater degree than at the Thirteenth; but if the shop is adequately to fulfill its functions at the Fourteenth Census, consideration of future means and methods can begin none too early.

REMOVAL TO DEPARTMENT OF COMMERCE BUILDING.

During June and July, 1914, the Bureau moved from its old quarters at First and B Streets NW. to the new Department of Commerce Building at Nineteenth Street and Pennsylvania Avenue NW., where

it occupies the greater part of the basement, a portion of the first floor, all of the second, third, fourth, and fifth floors, and parts of the sixth, seventh, and eighth floors. Its former library, which now forms the major portion of the consolidated Department library, is located on the tenth floor.

The new location is preferable to the old in many respects, not the least of which are better light, vastly improved facilities for ventilation, less heat in summer, more desk room, and more satisfactory physical conditions in general, resulting in better health and a greater degree of contentment on the part of the personnel, with a consequent increase in quality and quantity of output. Another advantage that should not be overlooked is the greatly minimized danger from fire. Since many of the Bureau's records are of great value and could not be duplicated if lost, their safety from destruction is a matter of more than ordinary importance.

APPROPRIATIONS AND EXPENDITURES.

FINANCIAL STATEMENT, FISCAL YEAR 1914.

In Appendix III is presented a financial statement for the Bureau of the Census, covering the fiscal year ended June 30, 1914.

APPROPRIATIONS, FISCAL YEAR 1915.

The appropriations for 1915 amounted to \$1,537,460. There was a decrease of \$21,280 in the item for salaries, due in part to the discontinuance of one clerical position and the transfer of certain others to the roll of the Department of Commerce, but principally to the discontinuance of a number of subclerical positions and the transfer of others to the roll of the Department as a result of the removal of the Bureau of the Census from its old quarters to the new Department building.

The appropriation for tabulating machines was reduced to \$12,000.

The item for collecting statistics was increased to \$835,000 in order to provide for the quinquennial census of manufactures, to be taken during the calendar year 1915.

The item for rent was discontinued by reason of the removal of the Bureau of the Census to the new Department building.

The appropriation for the purchase of books and periodicals remained unchanged.

The item for contingent expenses was discontinued, such expenses now being paid from the appropriations for the Department of Commerce.

RECOMMENDATIONS.

I.—I renew the following recommendation of changes in the scope of the Official Register,^a made in my annual report for the fiscal year ended June 30, 1914:

The enactment of legislation authorizing—

(1) The establishment of a card directory, prepared and maintained by the Civil Service Commission from information furnished

^a See also pp. 369 and 380.

by the executive departments and independent offices, showing the name and status of every person in the Government service except the officers and enlisted men of the Army, Navy, Marine Corps, and Revenue-Cutter Service. Lists of officers of the Army, Navy, and Marine Corps are already published annually in the Army Register and Navy Register, issued by the War and Navy Departments, respectively.

(2) The elimination from the Official Register of detailed lists of all employees, by name.

(3) The publication annually by the Bureau of the Census of an Official Register containing—

(a) A list of all employees of the Government (except officers and enlisted men in the Army, Navy, Marine Corps, and Revenue-Cutter Service) whose duties are of an executive, supervisory, technical, or professional character, and whose compensation is \$2,000 or more per annum.

(b) Statistics relating to the Government service, to be prepared from the Civil Service Commission's card directory.

The proposed plan, if adopted, will result in very material saving to the Government, will at the same time preserve all the valuable features of the present Official Register, and will provide for a complete and up-to-date record of the entire personnel of the Government in one central office (the Civil Service Commission) in such form that the Bureau of the Census, by the aid of its tabulating machinery, can quickly and accurately compile statistics relative to Federal employees when called upon to do so by the President or by Congress.

A bill substantially embodying the foregoing plan (except that \$1,500 instead of \$2,000 was fixed as the lowest compensation of employees whose names should be included in the Official Register) was introduced in the House of Representatives on August 8, 1913, by Hon. W. C. Houston, of Tennessee.

II.—I recommend the incorporation in the next urgent deficiency appropriation bill of a provision authorizing the payment, from the current printing appropriation for the Department of Commerce, of the cost of making necessary reprints of Thirteenth Census publications.*

The adoption of this recommendation would make it possible for the Bureau to comply with numerous requests for Thirteenth Census information which otherwise could not be furnished; the amount involved would be small; and no increase in the sum already appropriated would be needed.

Respectfully,

WM. J. HARRIS,
Director of the Census.

To Hon. WILLIAM C. REDFIELD,
Secretary of Commerce.

* See p. 382.

APPENDIXES.

APPENDIX I.

PUBLICATIONS ISSUED.^a

JULY 1, 1913, TO JUNE 30, 1914.

| Name or description. | When issued. | Pages. |
|--|---------------------------|--------|
| Thirteenth Census Reports (bound quarto volumes): | | |
| Population, 1910— | | |
| Vol. I. General report and analysis..... | Jan. 5, 1914..... | 1,369 |
| Vol. II. Reports by States, with statistics for counties, cities, and other civil divisions—Alabama to Montana..... | Aug. 23, 1913..... | 1,160 |
| Vol. III. Reports by States, with statistics for counties, cities, and other civil divisions—Nebraska to Wyoming; Alaska, Hawaii, and Porto Rico..... | Sept. 27, 1913..... | 1,225 |
| Agriculture, 1910—Vol. V. General report and analysis..... | Nov. 21, 1913..... | 927 |
| Manufactures, 1909— | | |
| Vol. VIII. General report and analysis..... | Sept. 15, 1913..... | 845 |
| Vol. X. Reports for principal industries..... | Dec. 30, 1913..... | 975 |
| Mining, 1910—Vol. XI. Mines and quarries..... | Dec. 30, 1913..... | 369 |
| Abstract of the Census ^b —three editions, with supplements for Alaska, Hawaii, and Porto Rico..... | Sept. 2-Oct. 3, 1913..... | ..... |
| Total..... | | 6,870 |
| Annual and other reports (bound quarto volumes): | | |
| General statistics of cities, 1909..... | Sept. 18, 1913..... | 197 |
| Financial statistics of cities, 1911..... | Dec. 8, 1913..... | 401 |
| Financial statistics of cities, 1912..... | June 6, 1914..... | 410 |
| Mortality statistics, 1910..... | Oct. 2, 1913..... | 611 |
| Mortality statistics, 1911..... | Dec. 17, 1913..... | 573 |
| Mortality statistics, 1912..... | Jan. 5, 1914..... | 382 |
| Benevolent institutions, 1910..... | Jan. 6, 1914..... | 411 |
| Official Register of the United States, 1913..... | Jan. 7, 1914..... | 876 |
| Total..... | | 3,860 |
| Thirteenth Census bulletins (quarto; unbound): | | |
| 3 editions of supplements to abstract of the census, relating, respectively, to Alaska, Hawaii, and Porto Rico..... | Sept. 2-Oct. 3, 1913.. | 190 |
| 16 reprints of chapters in Vol. I. Thirteenth Census reports..... | Feb. 26-28, 1914..... | 1,346 |
| 12 reprints of chapters in Vol. V. Thirteenth Census reports..... | Jan. 17-Feb. 5, 1914.. | 863 |
| 1 reprint of a chapter in Vol. VIII. Thirteenth Census reports—"Description of individual industries with principal statistics for each."..... | June 19, 1914..... | 145 |
| 33 bulletins, each relating to a particular industry or group of industries, the contents of which were later included in Vol. X, Thirteenth Census reports..... | July 2-Dec. 17, 1913. | 679 |
| 2 reprints of sections of Vol. X, Thirteenth Census reports, each relating to a group of industries—"Chemicals and allied products" and "Textiles."..... | Feb. 4, 1914..... | 274 |
| 1 reprint of a section of Vol. X, Thirteenth Census reports, relating to manufactures in metropolitan districts..... | Jan. 28, 1914..... | 77 |
| 1 bulletin, "Iron mines," which later formed a section of Vol. XI, Thirteenth Census reports..... | Sept. 8, 1913..... | 25 |
| 1 special Thirteenth Census bulletin, "Stability of farm operators, or term of occupancy of farms."..... | June 15, 1914..... | 22 |
| Total..... | | 3,621 |

^a In addition to the publications listed, the Bureau issued during the fiscal year approximately 250 press summaries of its reports and bulletins, and has issued about 75 such summaries since the close of the year. These summaries are in printed or multigraphed form, varying in length from three-fourths of a column to a column, and are distributed to an average of 1,200 to 1,500 daily newspapers and oftentimes to numerous weeklies as well. They are also sent to State officials, manufacturers, and others interested in the particular industries or subjects covered.

^b An edition of the Abstract without supplement and 48 editions with supplements for the 48 States, respectively, were issued prior to July 1, 1913. The number of pages in the supplements for Alaska, Hawaii, and Porto Rico is shown under the heading "Thirteenth Census bulletins."

PUBLICATIONS ISSUED—Continued.

JULY 1, 1913, TO JUNE 30, 1914—Continued.

| Name or description. | When issued. | Pages. |
|---|--------------------------------------|--------|
| Annual and other publications (unbound): | | |
| Bulletin 116. Cotton production, 1912 (quarto)..... | July 19, 1913..... | 63 |
| Bulletin 117. Supply and distribution of cotton for the year ending Aug. 31, 1913 (quarto)..... | Dec. 22, 1913..... | 40 |
| Bulletin 118. Financial statistics of cities, 1912 (quarto)..... | Dec. 22, 1913..... | 83 |
| Bulletin 119. Insane and feeble-minded in institutions, 1910 (quarto)... | Dec. 17, 1913..... | 99 |
| Bulletin 120. Paupers in almshouses, 1910 (quarto)..... | Dec. 31, 1913..... | 99 |
| Bulletin 121. Prisoners and juvenile delinquents, 1910 (quarto)..... | Jan. 3, 1914..... | 130 |
| Bulletin 122. Estimates of population, 1910 to 1914 (quarto)..... | Apr. 25, 1914..... | 12 |
| Bulletin 123. Telephones and telegraphs, 1912..... | May 21, 1914..... | 26 |
| Bulletin 124. Central electric light and power stations, and street and electric railways, 1912 (quarto)..... | June 12, 1914..... | 113 |
| Lumber, lath, and shingles, 1912 (octavo)..... | Jan. 29, 1914..... | 60 |
| Manual of the international list of causes of death, 1909 (second revision, octavo)..... | Oct. 4, 1913..... | 307 |
| Physicians' pocket reference to the international list of causes of death, 1913 (pamphlet, pocket size)..... | Sept. 6, 1913..... | 28 |
| Annual report of the Director of the Census to the Secretary of Commerce, 1912-13 (octavo)..... | Dec. 13, 1913..... | 31 |
| Ravages of the boll weevil (pamphlet, 12mo)..... | Jan. 27, 1914..... | 12 |
| Tentative program of the Bureau of the Census (circular of information, No. 1, octavo)..... | Feb. 9, 1914..... | 8 |
| Work of the permanent Census Bureau (circular of information, No. 3, octavo)..... | Apr. 28, 1914..... | 31 |
| 25 reports, in card form, relating to cotton and cottonseed..... | July 14, 1913, to June 11, 1914..... | 26 |
| 2 reports, in card form, relating to stocks of leaf tobacco..... | Nov. 13, 1913, and May 9, 1914..... | 2 |
| Total..... | | 1,169 |
| Grand total..... | | 15,530 |

JULY 1, 1914, TO OCTOBER 15, 1914.

| | | |
|---|-------------------------------|-------|
| Thirteenth Census report (quarto): Occupation statistics (Vol. IV)..... | July 7, 1914..... | 615 |
| Thirteenth Census bulletins (quarto): | | |
| Occupation statistics (abstract of full report)..... | Aug. 14, 1914..... | 107 |
| Occupation statistics—Cities of 100,000 inhabitants or more (reprint of Table III, Vol. IV)..... | July 21, 1914..... | 87 |
| Occupation statistics—Cities of 25,000 to 100,000 inhabitants (reprint of Table IV, Vol. IV)..... | July 21, 1914..... | 85 |
| Occupation statistics—Alaska, Hawaii, and Porto Rico (reprint of Tables V and IX, Vol. IV)..... | July 10, 1914..... | 18 |
| Age of farmers, by color of operator, character of tenure, and size of farm..... | Aug. 13, 1914..... | 85 |
| Total..... | | 917 |
| Annual and other publications (unbound): | | |
| Bulletin 125. Cotton production, 1913 (quarto)..... | July 23, 1914..... | 79 |
| Bulletin 126. Financial statistics of cities, 1913 (quarto)..... | Sept. 14, 1914..... | 73 |
| National and State indebtedness and funds and investments, 1870-1913 (quarto)..... | July 10, 1914..... | 208 |
| Index of joint causes of death (octavo)..... | Aug. 27, 1914..... | 308 |
| 6 reports, in card form, relating to cotton production and consumption.. | July 14 to Oct. 14, 1914..... | 6 |
| Total..... | | 699 |
| Grand total..... | | 1,596 |

APPENDIX II.

STATEMENT SHOWING NATURE AND DISTRIBUTION OF OFFICE AND
FIELD FORCE, SEPTEMBER 30, 1914

OFFICIALS.

| | |
|--|----------------------|
| Chief clerk | WILLIAM L. AUSTIN. |
| Chief statisticians: | |
| Population | WILLIAM C. HUNT. |
| Statistics of cities | STARKE M. GOGAN. |
| Manufactures | WILLIAM M. STEUART. |
| Expert special agent in charge of revision and results | JOSEPH A. HILL. |
| Geographer | CHARLES S. SLOANE. |
| Expert chiefs of division: | |
| Population | WILLIAM H. JARVIS. |
| Statistics of cities | EDWARD W. KOCH. |
| Manufactures | ARTHUR J. HIRSCH. |
| | HICKMAN P. CHILDERS. |
| | JOSEPH D. LEWIS. |
| | FRANK L. SANFORD. |
| Vital statistics | RICHARD C. LAPPIN. |
| Revision and results | HARRY H. PIERCE. |
| Chief mechanician | E. M. LABOITRAUX. |

CLERICAL FORCE.

| | | | |
|-----------------------|-----|---------|-----|
| Stenographer, \$1,500 | 1 | Clerks: | |
| Clerks: | | \$1,000 | 82 |
| Class 4 | 11 | \$900 | 78 |
| Class 8 | 20 | | |
| Class 2 | 38 | Total | 531 |
| Class 1 | 301 | | |

SUBCLERICAL FORCE.

| | | | |
|---------------------------|---|-----------------------------|----|
| Engineer, \$1,000 | 1 | Assistant messengers, \$720 | 5 |
| Skilled laborers: | | Messenger boys, \$480 | 4 |
| \$1,000 | 1 | Watchmen, \$720 | 2 |
| \$900 | 3 | Firemen, \$720 | 1 |
| \$720 | 5 | Charwomen, \$240 | 5 |
| Unskilled laborers, \$720 | 3 | | |
| Messengers, \$840 | 8 | Total | 33 |

MACHINE-SHOP FORCE.

| | | | |
|----------------------------|---|---------------------------|---|
| Electrical expert, \$1,600 | 1 | Electrician, \$1,200 | 1 |
| Mechanical expert, \$1,600 | 1 | General mechanic, \$1,000 | 1 |
| Mechanical expert, \$1,200 | 1 | | |
| Mechanician, \$1,200 | 2 | Total | 7 |

SPECIAL-AGENT FORCE.

| | |
|---|----|
| Expert agents for general field work, etc | 58 |
|---|----|

SUMMARY OF CENSUS FORCE.

| | | | |
|--|-----|--------------------------------|-----|
| Officials | 15 | Special agents (general force) | 58 |
| Clerical | 531 | | |
| Subclerical | 33 | Total office force | 644 |
| Machine shop | 7 | | |
| Special agents to collect statistics of cotton | 754 | | |

APPENDIX III.

FINANCIAL STATEMENT, FISCAL YEAR 1914.

| | | |
|--|-------------|---------------------|
| Administrative: | | |
| Salaries for administrative places | \$34,963.61 | |
| Salaries for division of correspondence and mail | 21,148.48 | |
| Salaries for library | 5,362.60 | |
| Salaries for watch, labor, and char forces | 25,740.51 | |
| Rent | 21,000.00 | |
| Stationery | 3,218.32 | |
| Miscellaneous expenses | 21,590.69 | |
| Books and periodicals | 490.73 | |
| Total | | \$138,514.94 |
| Machine shop: | | |
| Salaries | 10,739.43 | |
| Materials, supplies, etc. | 84.46 | |
| Total | | 10,773.89 |
| Geographer's division: Salaries | | |
| Thirteenth Census work: | | 20,697.84 |
| Population— | | |
| Supervision | \$11,291.64 | |
| General and State reports | 19,141.13 | |
| Occupations | 114,062.44 | |
| Tenure of homes | 31,124.56 | |
| Miscellaneous work | 9,546.68 | |
| Total | | 185,156.45 |
| Agriculture— | | |
| Supervision * | 7,790.11 | |
| General and State reports | 8,553.63 | |
| Color, tenure, and size | 1,248.88 | |
| Plantations | 194.04 | |
| Irrigation | 116.66 | |
| Total | | 17,888.32 |
| Manufactures | | |
| Supervision * | 9,445.77 | |
| Completion of manufactures reports | 11,832.36 | |
| Industrial districts | 2,281.66 | |
| Mines and quarries | 2,541.89 | |
| Total | | 25,651.18 |
| Institutions | 22,715.17 | |
| Revision and results | 16,769.80 | |
| Publications | 9,950.28 | |
| Negroes in the United States | 695.56 | |
| Chinese and Japanese | 216.67 | |
| Total | | 279,042.93 |
| Annual investigations: | | |
| Cotton | 257,100.03 | |
| Tobacco | 10,239.29 | |
| Forest products | 3,670.78 | |
| Electrical industries | 73,280.87 | |
| Vital statistics | 82,423.41 | |
| Statistics of cities | 66,445.36 | |
| Total | | 493,159.74 |
| Wealth, debt, and taxation | 151,477.86 | |
| Census of manufactures, 1914 | 32,804.89 | |
| Official Register | 8,911.84 | |
| Miscellaneous | 7,642.33 | |
| Grand total | | 1,133,026.26 |

| Title of appropriation. | Appropriation. | Expenditure. |
|---|---------------------|---------------------|
| Salaries, Bureau of the Census, 1914 | \$711,240.00 | \$693,245.53 |
| Tabulating machines, Bureau of the Census, 1914 | 12,500.00 | 10,773.89 |
| Collecting statistics, Bureau of the Census, 1914 * | 404,000.00 | 382,707.11 |
| Rent, Bureau of the Census, 1914 | 22,000.00 | 21,000.00 |
| Purchase of books of reference and periodicals | 500.00 | 490.73 |
| Contingent expenses | 25,000.00 | 24,809.01 |
| Total | 1,175,320.00 | 1,133,026.26 |

* Includes cost of supervision for wealth, debt, and taxation.

* Includes cost of supervision for forest products, cotton, tobacco, electrical industries, and preliminary work on census of 1914.

* Includes unexpended balance of appropriation for collecting statistics, Bureau of the Census, 1913, \$80,000, transferred to appropriation for 1914 by urgent deficiency act of Oct. 22, 1913.

REPORT
OF THE
COMMISSIONER OF FISHERIES

391

REPORT

OF THE

COMMISSIONER OF FISHERIES.

DEPARTMENT OF COMMERCE,
BUREAU OF FISHERIES,
Washington, October 12, 1914.

SIR: There is submitted herewith a report giving an outline review of the operations of the Bureau of Fisheries during the fiscal year ended June 30, 1914.

THE FISHING INDUSTRY.

GENERAL CONDITION OF THE FISHERIES.

The general condition of the fishing industry of the United States at the present time is satisfactory. Each year shows an increased aggregate output with increased income to the fishermen, dependent on various factors. Among the influences tending to produce an augmented catch are (1) natural expansion of fishing operations in fields where the limit of productivity has not been reached, (2) exploitation of new or little-resorted-to grounds, (3) utilization of aquatic resources formerly neglected or little used, and (4) actual increase in abundance of products owing to artificial propagation, protective measures, or natural causes.

Certain branches, however, which have long exhibited a downward trend continue in the same condition; others are showing a sharp decline of comparatively recent origin; and still others are affected by a purely temporary or seasonal scarcity of supply. In the case of some species, a markedly diminished catch is attended by an actual increase in the income of the fishermen therefrom because of an artificial rise in price. Under such circumstances, fishermen are likely to report a particular fishery as in excellent condition and thus to create an entirely erroneous impression which the fish-eating public finds difficulty in reconciling with personal experience.

Among the more valuable food fishes about which there is reason for the most solicitude are the anadromous species of the Atlantic seaboard, particularly the shad and the alewives or river herrings. Notwithstanding the most unmistakable demand for immediate and radical action on the part of States to preserve these fisheries, nothing noteworthy has been accomplished, and vast food supplies and sources of income to the fishermen are being sacrificed.

The distressing conditions which have been permitted to arise and continue in Chesapeake Bay and tributaries were referred to at some length in the last annual report. The season of 1913 was stated to be

the worst in some respects for shad and alewives in 40 years. The season of 1914 was even worse, and a general failure of the fisheries in both salt and fresh water was recorded. This failure depended solely on the scarcity of fish. The only measure of relief that has been afforded to the sadly harassed schools of spawning fish has come from the exercise by the Federal Government of arbitrary authority over the waters for purposes of navigation, which has insured the opening of narrow lanes through the mazes of fixed nets that fringe the shores and block the streams.

NEW ENGLAND VESSEL FISHERIES.

The most extensive and valuable sea fisheries of the country are those centering at Boston and Gloucester, Mass., where, for a long term of years, detailed statistical and other data have been collected by the Bureau through local agents. The statistics are published monthly and annually in one-sheet bulletins which are issued to the trade. The extent of these fisheries in the calendar year 1913 is shown by months and by fishing grounds in the tables which follow.

Taken as a whole, the New England vessel fisheries were less successful in 1913 than in 1912. The catch of cod, cusk, haddock, and hake decreased, while pollock, halibut, mackerel, and swordfish were caught in larger quantities. More fares of fish were landed and the value of the product was greater than in 1912.

The fleet numbered approximately 250 sailing vessels and 175 steam and gasoline screw vessels. Vessels landing their catches at Boston made 3,582 trips, aggregating 92,351,594 pounds, valued at \$2,988,552; vessels making Gloucester their headquarters brought in 5,247 trips, aggregating 69,865,192 pounds, valued at \$1,994,465. The combined fleets landed 8,829 fares, comprising 162,216,786 pounds and having a first value of \$4,983,017. Compared with 1912, there were an increase of 1,180 trips, a decrease of 20,487,273 pounds, and an increase of \$203,758. Practically all receipts at Boston are fresh, while at Gloucester about three-sevenths of the catch are salted. The herring fishery on the treaty shores of Newfoundland showed a marked decline in both frozen and salt fish.

QUANTITY AND VALUE OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1913, SHOWN BY MONTHS.

| Month. | Number of trips. | Cod. | | Cusk. | | Haddock. | | | |
|---------------------------------------|------------------|------------|----------|------------|---------|------------|------------|-----------|--------|
| | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| | | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. |
| LANDED IN BOSTON. | | | | | | | | | |
| January..... | 266 | 1,121,500 | \$44,345 | 307,600 | \$8,026 | 4,367,200 | \$150,709 | | |
| February..... | 212 | 1,764,250 | 34,125 | 201,000 | 5,079 | 4,473,500 | 171,642 | | |
| March..... | 333 | 1,253,600 | 49,276 | 306,500 | 6,797 | 4,735,000 | 119,444 | | |
| April..... | 276 | 2,183,400 | 66,029 | 525,800 | 7,287 | 4,256,260 | 98,186 | | |
| May..... | 205 | 1,999,675 | 50,402 | 274,400 | 4,481 | 2,613,300 | 67,752 | | |
| June..... | 271 | 2,133,080 | 72,980 | 196,900 | 3,212 | 2,960,560 | 81,635 | | |
| July..... | 352 | 1,535,750 | 66,682 | 170,000 | 3,189 | 4,217,360 | 78,134 | | |
| August..... | 417 | 2,350,900 | 74,553 | 218,800 | 4,323 | 4,064,000 | 89,638 | | |
| September..... | 331 | 2,567,607 | 91,357 | 99,320 | 2,188 | 4,311,605 | 126,965 | | |
| October..... | 358 | 1,454,560 | 57,819 | 214,700 | 4,771 | 4,446,460 | 139,202 | | \$75 |
| November..... | 356 | 1,243,209 | 41,608 | 492,194 | 7,755 | 3,219,085 | 113,723 | | |
| December..... | 248 | 993,647 | 34,943 | 276,534 | 5,164 | 2,534,249 | 106,637 | | |
| Total..... | 3,582 | 19,815,718 | 683,118 | 3,282,548 | 62,271 | 46,008,539 | 1,335,963 | 2,500 | 75 |
| LANDED AT GLOUCESTER. | | | | | | | | | |
| January..... | 614 | 299,550 | 13,280 | 652,207 | 29,861 | 815,400 | 22,006 | 4,090 | 61 |
| February..... | 513 | 319,735 | 17,729 | 197,745 | 8,308 | 1,033,365 | 34,089 | 6,585 | 90 |
| March..... | 499 | 318,320 | 18,016 | 123,965 | 238 | 303,980 | 11,089 | 2,550 | 49 |
| April..... | 517 | 1,532,630 | 38,499 | 194,015 | 312 | 1,063,830 | 32,650 | 5,620 | 88 |
| May..... | 240 | 2,460,290 | 83,767 | 222,170 | 2,850 | 5,313,360 | 41,924 | 13,715 | 297 |
| June..... | 211 | 3,315,241 | 124,883 | 371,901 | 2,916 | 5,313,360 | 41,924 | 38,000 | 555 |
| July..... | 178 | 703,508 | 24,186 | 67,901 | 1,043 | 1,063,830 | 32,650 | 36,905 | 473 |
| August..... | 108 | 592,114 | 12,313 | 576,389 | 7,796 | 2,848,270 | 7,655 | 31,639 | 686 |
| September..... | 119 | 846,293 | 17,639 | 676,389 | 8,314 | 40,882 | 5,001 | 45,730 | 463 |
| October..... | 181 | 419,637 | 15,639 | 1,469,465 | 4,014 | 12,590 | 1,333 | 30,862 | 143 |
| November..... | 724 | 337,165 | 12,650 | 2,202,298 | 2,221 | 14,170 | 2,149 | 8,118 | 68 |
| December..... | 713 | 152,581 | 6,654 | 2,202,562 | 9,283 | 1,715 | 265 | 3,350 | |
| Total..... | 5,247 | 9,361,513 | 238,947 | 15,683,582 | 37,015 | 140,547 | 149,031 | 234,369 | 3,557 |
| Grand total..... | | | | | | | | | |
| Grounds E. of 66° west longitude..... | 8,829 | 29,177,231 | 922,065 | 15,687,582 | 99,296 | 143,547 | 1,484,724 | 236,969 | 3,632 |
| Grounds W. of 66° west longitude..... | 714 | 8,312,784 | 203,506 | 12,891,996 | 40,907 | 77,276 | 6,614,232 | 88,662 | 1,349 |
| Grounds E. of 66° west longitude..... | 8,115 | 20,864,447 | 718,550 | 2,796,586 | 58,379 | 66,271 | 1,432 | 1,323,969 | 2,283 |
| Landed at Boston in 1912..... | 3,676 | 23,413,300 | 794,382 | 3,066,100 | 61,176 | ..... | 52,777,200 | 1,162,994 | ..... |
| Landed at Gloucester in 1912..... | 3,973 | 12,105,520 | 243,669 | 18,186,308 | 43,301 | 183,369 | 10,447,586 | 322,441 | 4,468 |

QUANTITY AND VALUE OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1913, SHOWN BY MONTHS—Continued.

| Month. | Hake. | | | Pollock. | | | Halibut. | | |
|---------------------------------------|-----------------|-----------------|------------|-----------------|---------------|---------|----------------|---------------|---------|
| | Fresh. | Salted. | Value. | Fresh. | Salted. | Value. | Fresh. | Salted. | Value. |
| LANDED AT BOSTON. | | | | | | | | | |
| January..... | Pounds. 435,350 | Value. \$18,766 | 177,125 | Pounds. \$5,260 | Value. 62,630 | \$9,832 | Pounds. 62,630 | Value. 62,630 | \$9,832 |
| February..... | 270,750 | 13,625 | 114,880 | 4,511 | 33,361 | 7,716 | 33,361 | 33,361 | 7,716 |
| March..... | 309,700 | 13,012 | 114,800 | 5,501 | 91,225 | 12,488 | 91,225 | 91,225 | 12,488 |
| April..... | 834,100 | 20,089 | 299,150 | 3,034 | 173,500 | 6,759 | 134,480 | 13,415 | 6,777 |
| May..... | 798,900 | 12,280 | 296,000 | 5,457 | 220,815 | 15,625 | 77,680 | 6,759 | 6,759 |
| June..... | 1,455,900 | 22,029 | 392,400 | 8,528 | 163,735 | 13,901 | 220,815 | 15,625 | 15,625 |
| July..... | 1,685,550 | 14,837 | 671,500 | 11,384 | 103,400 | 11,910 | 163,735 | 13,901 | 13,901 |
| August..... | 867,500 | 15,749 | 974,640 | 22,066 | 62,544 | 6,887 | 103,400 | 11,910 | 11,910 |
| September..... | 859,800 | 23,725 | 400,310 | 13,682 | 250 | 4,712 | 163,400 | 6,887 | 6,887 |
| October..... | 1,008,500 | 42,088 | 319,616 | 5,628 | 3 | 3 | 39,220 | 4,712 | 4,712 |
| November..... | 1,473,912 | 25,830 | 471,634 | 7,408 | 25,455 | 6,388 | 27,175 | 4,579 | 4,579 |
| December..... | 1,509,638 | 14,362 | 471,634 | 7,408 | 25,455 | 6,388 | 25,455 | 6,388 | 6,388 |
| Total..... | 10,119,660 | 236,432 | 4,316,465 | 98,036 | 3 | 3 | 1,103,920 | 114,262 | 114,262 |
| LANDED AT GLOUCESTER. | | | | | | | | | |
| January..... | Pounds. 86,600 | Value. 4,078 | 490,315 | Pounds. 16,066 | Value. 11,110 | 167 | 64,009 | 2,275 | \$228 |
| February..... | 35,510 | 2,188 | 385,070 | 18,545 | 14,935 | 224 | 154,000 | 70 | 7 |
| March..... | 22,115 | 1,305 | 123,977 | 6,286 | 7,740 | 116 | 208,020 | 22,965 | 305 |
| April..... | 109,490 | 1,754 | 305,300 | 5,416 | 4,150 | 62 | 415,918 | 39,811 | 111 |
| May..... | 374,260 | 3,618 | 991,995 | 10,514 | 17,570 | 283 | 816,546 | 48,100 | 1,682 |
| June..... | 387,630 | 3,489 | 420,354 | 10,514 | 41,942 | 628 | 490,723 | 33,887 | 17,815 |
| July..... | 519,425 | 4,675 | 96,185 | 1,223 | 49,505 | 743 | 548,369 | 37,203 | 28,914 |
| August..... | 572,165 | 5,862 | 53,537 | 924 | 29,450 | 442 | 486,672 | 34,453 | 2,631 |
| September..... | 437,700 | 4,934 | 95,529 | 924 | 36,566 | 541 | 207,645 | 22,465 | 1,739 |
| October..... | 515,879 | 6,472 | 57,300 | 1,335 | 11,541 | 166 | 87,795 | 8,361 | 42,997 |
| November..... | 7,269 | 5,672 | 4,260,777 | 47,195 | 7,020 | 100 | 133,255 | 11,960 | 237 |
| December..... | 411,818 | 354 | 3,446,384 | 48,468 | 6,426 | 109 | 49,689 | 2,365 | 237 |
| Total..... | 3,620,328 | 49,780 | 10,714,703 | 159,867 | 236,983 | 8,561 | 3,652,941 | 294,807 | 531,663 |
| Grand total..... | 13,739,988 | 286,192 | 15,031,168 | 257,993 | 236,233 | 3,564 | 4,756,561 | 408,899 | 531,563 |
| Grounds E. of 66° west longitude..... | | | | | | | | | |
| Grounds W. of 66° west longitude..... | 3,483,499 | 54,206 | 346,773 | 5,126 | 76,016 | 1,145 | 3,862,238 | 323,196 | 599,254 |
| Landed at Boston in 1912..... | 10,256,499 | 231,986 | 14,684,306 | 282,867 | 160,217 | 2,419 | 804,323 | 86,673 | 2,339 |
| Landed at Gloucester in 1912..... | 11,381,560 | 213,542 | 4,266,030 | 96,983 | 307,313 | 4,571 | 846,390 | 90,846 | 480,903 |
| Total..... | 3,807,183 | 37,822 | 10,060,319 | 141,572 | 307,313 | 4,571 | 2,214,246 | 209,719 | 46,686 |

| Month. | Mackerel. | | | | Miscellaneous. | | | | Total. | | | | Grand total. |
|-----------------------------------|-----------|----------|-----------|---------|----------------|---------|-----------|---------|-------------|-----------|------------|-----------|--------------|
| | Fresh. | | Salted. | | Fresh. | | Salted. | | Fresh. | | Salted. | | |
| | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | |
| LANDED AT BOSTON. | | | | | | | | | | | | | |
| January..... | | | | | | | | | | | | | |
| February..... | | | | | | | | | | | | | |
| March..... | | | | | | | | | | | | | |
| April..... | | | | | | | | | | | | | |
| May..... | | | | | | | | | | | | | |
| June..... | 1,329,300 | \$80,280 | 62,400 | \$3,690 | 140,400 | 15,325 | 5,000 | \$150 | 6,471,405 | \$236,937 | 6,471,405 | \$236,937 | |
| July..... | 757,900 | 41,393 | 19,400 | 876 | 1,292,750 | 103,893 | | | 5,857,751 | 236,698 | 5,857,751 | 236,698 | |
| August..... | 1,050,160 | 66,342 | 36,600 | 2,121 | 664,400 | 48,698 | | | 6,969,625 | 210,277 | 6,969,625 | 210,277 | |
| September..... | 227,028 | 14,712 | 4,400 | 235 | 626,628 | 33,598 | | | 8,213,180 | 200,582 | 8,213,180 | 200,582 | |
| October..... | 344,500 | 18,573 | 3,000 | 180 | 334,775 | 7,478 | | | 5,737,455 | 144,708 | 5,737,455 | 144,708 | |
| November..... | 8,391 | 1,528 | | | 419,771 | 8,784 | | | 8,759,985 | 300,383 | 8,759,985 | 300,383 | |
| December..... | 1,172 | 1,465 | | | 198,519 | 6,433 | | | 9,636,535 | 324,705 | 9,636,535 | 324,705 | |
| Total..... | 3,718,451 | 223,293 | 125,800 | 6,802 | 3,837,243 | 227,939 | 5,000 | 150 | 92,202,544 | 2,981,044 | 92,351,594 | 2,988,552 | |
| LANDED AT GLOUCESTER. | | | | | | | | | | | | | |
| January..... | | | | | | | | | | | | | |
| February..... | | | | | | | | | | | | | |
| March..... | | | | | | | | | | | | | |
| April..... | | | | | | | | | | | | | |
| May..... | 1,880 | 150 | | 20 | 109,800 | 1,647 | | | 2,913,764 | 104,985 | 5,082,758 | 101,866 | 206,851 |
| June..... | 43,200 | 2,114 | 259,000 | 15,540 | 609,200 | 5,995 | | | 1,301,145 | 74,227 | 263,565 | 8,722 | 82,949 |
| July..... | 17,410 | 1,292 | 137,000 | 9,280 | 443,000 | 3,318 | | | 1,898,837 | 81,751 | 317,701 | 11,342 | 93,093 |
| August..... | 6,480 | 462 | 266,000 | 17,954 | 19,536 | 591 | | | 4,674,276 | 131,228 | 236,436 | 10,892 | 142,120 |
| September..... | 19,980 | 2,103 | 299,000 | 21,968 | 525,320 | 4,464 | | | 3,989,594 | 79,450 | 3,749,210 | 150,388 | 229,838 |
| October..... | 454,175 | 20,198 | 169,000 | 13,187 | 519,000 | 5,296 | | | 3,124,169 | 70,098 | 1,754,262 | 74,383 | 144,481 |
| November..... | 25,669 | 2,297 | 127,200 | 9,877 | 28,800 | 1,466 | | | 2,403,212 | 55,783 | 1,890,309 | 91,473 | 197,905 |
| December..... | 5,357 | 541 | | | 190,600 | 6,696 | | | 5,373,766 | 87,217 | 3,275,797 | 123,324 | 210,541 |
| Total..... | 574,151 | 29,157 | 1,257,600 | 87,816 | 3,884,006 | 68,978 | 9,676,776 | 159,918 | 41,767,740 | 1,027,452 | 28,097,452 | 967,013 | 1,994,465 |
| Grand total..... | 4,292,602 | 252,450 | 1,383,400 | 94,618 | 7,721,249 | 296,917 | 9,681,776 | 190,088 | 133,970,284 | 4,008,496 | 28,246,502 | 974,521 | 4,983,017 |
| Grounds E. of 66° west long..... | | | | | | | | | | | | | |
| Grounds W. of 66° west long..... | 1,041,100 | 65,536 | 467,400 | 33,796 | 2,176,007 | 80,893 | 9,681,776 | 190,088 | 28,440,452 | 934,114 | 24,131,529 | 784,081 | 1,718,195 |
| Landed at Boston in 1912..... | 3,251,502 | 186,914 | 916,000 | 60,822 | 5,545,242 | 216,035 | | | 105,529,832 | 3,074,382 | 4,114,973 | 190,440 | 109,644,805 |
| Landed at Gloucester in 1912..... | 2,496,620 | 148,496 | 143,000 | 9,442 | 1,906,890 | 163,530 | | | 100,157,080 | 2,721,949 | 143,000 | 9,442 | 100,300,080 |
| Landed at Gloucester in 1912..... | 2,163,620 | 9,390 | 1,405,000 | 101,010 | 9,061,150 | 200,547 | | | 51,263,696 | 1,055,295 | 31,140,284 | 992,573 | 52,403,979 |

^a Includes herring from Newfoundland—1,778,750 pounds frozen, \$49,965, and 9,676,376 pounds salted, \$159,883.

QUANTITY AND VALUE OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1913, SHOWN BY FISHING GROUNDS.

| Fishing grounds. | Number of trips. | Cod. | | Cusk. | | Haddock. | | | |
|-------------------------------|------------------|------------|---------|---------|--------|-----------|--------|------------|-----------|
| | | Fresh. | | Salted. | | Fresh. | | Salted. | |
| | | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. |
| LANDED AT BOSTON. | | | | | | | | | |
| East of 68° west longitude. | | | | | | | | | |
| La Have Bank..... | 19 | 217,565 | \$7,912 | | | | | | |
| Western Bank..... | 26 | 623,300 | 16,724 | | | | | | |
| Queen Bank..... | 8 | 326,800 | 7,548 | | | | | | |
| Green Bank..... | 3 | | | | | | | | |
| Old Bank..... | 1 | | | | | | | | |
| Off Newfoundland..... | 1 | | | 4,000 | \$180 | 3,000 | \$60 | | |
| Off Cape Shore..... | 194 | 1,684,542 | 58,881 | | | 467,408 | 8,901 | | |
| Off Gulf of St. Lawrence..... | 2 | 20,000 | | | | | | | |
| St. Ann's Bank..... | 5 | 153,722 | 3,942 | | | | | 86,390 | 2,907 |
| West of 68° west longitude. | | | | | | | | | |
| Brown's Bank..... | 175 | 1,907,615 | 59,198 | | | 893,359 | 15,516 | | |
| Georges Bank..... | 488 | 4,634,810 | 148,046 | | | 156,730 | 3,011 | 5,926,246 | 134,514 |
| Cashes Bank..... | 12 | 69,488 | 2,042 | | | 56,965 | 1,124 | 8,712,941 | 249,071 |
| Clark Bank..... | 1 | 12,000 | | | | | | 22,213 | 467 |
| Finnel Bank..... | 18 | 77,546 | 2,552 | | | | | 40,000 | 1,200 |
| Thames Bank..... | 17 | 27,399 | 72,030 | | | 72,787 | 1,264 | 48,648 | 1,731 |
| Middle Bank..... | 487 | 758,128 | 29,731 | | | 12,179 | 1,193 | 68,657 | 2,798 |
| Platts Bank..... | 1 | 12,583 | | | | 227,583 | 4,732 | 2,043,973 | 78,637 |
| Jaffray's Ledge..... | 307 | 601,310 | 22,898 | | | 5,728 | 90 | 1,650 | 60 |
| Ipswich Bay..... | 3 | | | | | 241,337 | 5,343 | 900,468 | 40,468 |
| South Channel..... | 768 | 4,988,087 | 182,768 | | | 226,773 | 4,209 | 19,663,407 | 553,927 |
| Nantuxet Shoals..... | 83 | 1,370,193 | 47,058 | | | | 1,440 | 641,880 | 14,487 |
| Off Highland Light..... | 13 | 15,728 | | | | 13,645 | 277 | 90,180 | 3,784 |
| Off Chatham..... | 269 | 563,286 | 21,891 | | | 27,000 | 653 | 2,320,537 | 64,639 |
| Bay of Fundy..... | 1 | | | | | | | | |
| Seal Island..... | 2 | 7,047 | 182 | | | 8,138 | 108 | 37,382 | 982 |
| Shore, general..... | 663 | 1,718,555 | 64,824 | | | 466,482 | 8,787 | 846,328 | 31,652 |
| Total..... | 3,582 | 19,815,718 | 683,118 | 4,000 | 180 | 3,282,548 | 62,271 | 46,008,539 | 1,335,963 |
| | | | | | | 3,000 | 60 | 2,500 | 75 |

LANDED AT GLOUCESTER.
East of 68° west longitude.

| | | | | | | | | | | | | |
|-----------------------------|------------|---------|------------|---------|-----------|--------|---------|-------|------------|-----------|---------|-------|
| 35 | 285,224 | 5,435 | 54,505 | 2,307 | 587,875 | 8,451 | 21,550 | 470 | 344,145 | 4,069 | 3,570 | 54 |
| 89 | 2,474,635 | 46,647 | 327,800 | 13,224 | 574,503 | 8,320 | 13,790 | 310 | 1,171,727 | 11,564 | 4,352 | 66 |
| 48 | 518,564 | 10,717 | 1,076,731 | 44,797 | 31,430 | 4,480 | 2,745 | 61 | 37,012 | 396 | 21,875 | 343 |
| 28 | 28,985 | 630 | 166,875 | 7,643 | 7,060 | 92 | 1,951 | 45 | | | 525 | 8 |
| 57 | 148,130 | 2,952 | 4,020,133 | 170,133 | 10,785 | 159 | 6,270 | 123 | 2,050 | 19 | 16,020 | 242 |
| 2 | 1,780 | 40 | 21,080 | 902 | | | 90 | 2 | | | | 4 |
| 3 | 8,750 | 168 | 17,995 | 721 | | | 40 | 1 | | | | |
| 55 | | | 3,812,146 | 189,643 | | | | | | | 11,520 | 174 |
| Off Newfoundland | 1,330,302 | 25,401 | 2,066,063 | 78,039 | 27,065 | 379 | 630 | 14 | 54,200 | 494 | 20,805 | 309 |
| Cape North | 257,045 | 6,070 | 194,740 | 9,045 | 437,633 | 7,374 | 27,825 | 655 | 278,850 | 6,560 | 8,640 | 130 |
| Cape Shore | 141,100 | 2,722 | 472,968 | 19,187 | 437,960 | 14 | 270 | 6 | | | 1,285 | 19 |
| Gulf of St. Lawrence | 83,600 | 1,554 | | | | | | | | | | |
| St. Ann's Bank | 28,740 | 601 | 38,247 | 1,665 | 9,645 | 142 | 125 | 3 | 10,335 | 93 | | |
| The Gully | | | 599,113 | 21,558 | | | | | 730 | 7 | | |
| Labrador Coast | | | | | | | | | | | | |
| West of 68° west longitude. | | | | | | | | | | | | |
| 47 | 461,633 | 9,953 | 475,762 | 20,750 | 364,950 | 4,804 | 31,230 | 658 | 337,880 | 5,179 | 32,350 | 494 |
| Browns Bank | 1,648,892 | 34,518 | 2,319,824 | 102,016 | 273,561 | 3,633 | 36,041 | 774 | 2,531,703 | 26,093 | 113,357 | 1,724 |
| Georges Bank | 20,665 | 419 | | | 68,862 | 968 | | | 9,540 | 86 | | |
| Cashes Bank | | | | | | | | | | | | |
| Middle Bank | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| Ipswich Bay | 49,622 | 1,036 | | | | | | | 68,875 | 620 | | |
| South Channel | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| Nantucket Shoals | | | | | | | | | | | | |
| 72 | | | | | | | | | | | | |
| Off Chatham | 1,100 | 23 | | | 1,100 | 15 | | | 800 | 7 | | |
| Bay of Fundy | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | |
| South | | | | | | | | | | | | |
| 4,337 | 1,891,746 | 87,401 | | | 137,632 | 2,124 | | | 2,519,410 | 93,244 | | |
| Shore, general | | | | | | | | | | | | |
| Total | 9,361,513 | 238,947 | 15,683,582 | 652,630 | 2,533,141 | 37,015 | 140,547 | 3,122 | 7,427,557 | 149,031 | 224,369 | 3,557 |
| Grand total | 20,177,231 | 922,065 | 15,687,582 | 652,810 | 5,815,689 | 99,286 | 143,547 | 3,182 | 53,435,796 | 1,484,724 | 226,869 | 3,632 |

QUANTITY AND VALUE OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1913, SHOWN BY FISHING GROUNDS—Continued.

| Fishing grounds. | Hake. | | Pollock. | | Halibut. | |
|------------------------------------|------------|---------|-----------|---------|-----------|---------|
| | Fresh. | Salted. | Fresh. | Salted. | Fresh. | Salted. |
| | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. |
| LANDED AT BOSTON. | | | | | | |
| <i>East of 68° west longitude.</i> | | | | | | |
| La Have Bank | 93,045 | \$2,049 | 11,510 | \$297 | 82,232 | \$8,677 |
| Western Bank | 59,040 | 1,561 | 31,100 | 694 | 166,076 | 13,686 |
| Quebec Bank | 33,000 | 660 | 1,000 | 40 | 57,800 | 6,534 |
| Green Bank | | | | | 70,000 | 6,100 |
| Grand Bank | 9,220 | 128 | | | 47,000 | 2,645 |
| Cape Shore. | 1,064,406 | 25,783 | 113,145 | 2,478 | 104,538 | 12,941 |
| Gulf of St. Lawrence | | | | | 111,000 | 6,400 |
| St. Ann's Bank | 10,742 | 253 | 375 | 3 | 111,254 | 6,58 |
| <i>West of 68° west longitude.</i> | | | | | | |
| Brown's Bank | 411,820 | 10,617 | 203,865 | 5,285 | 156,180 | 20,381 |
| Georges Bank | 296,660 | 6,597 | 350,135 | 7,756 | 209,811 | 23,456 |
| Cashes Bank | 86,499 | 1,822 | 8,660 | 179 | 4,390 | 408 |
| Clark Bank | | | 14,815 | 315 | 200 | 20 |
| Flippin's Bank | 147,865 | 3,275 | 12,800 | 315 | 5,023 | 532 |
| Willes Bank | 85,800 | 1,449 | 194 | | 179 | 34 |
| Middle Bank | 1,244,700 | 36,308 | 578,228 | 11,694 | 7,556 | 1,075 |
| Platts Bank | 9,775 | 152 | 2,060 | 51 | 21 | 3 |
| Fedrys Lodge | 788,602 | 22,649 | 1,157,128 | 27,451 | 5,922 | 803 |
| Jennych Bay | | | 74,205 | 677 | | |
| South Channel | 2,817,394 | 62,463 | 727,830 | 15,056 | 73,949 | 8,048 |
| Narrick's Shoals | 51,820 | 953 | 78,840 | 1,526 | 300 | 30 |
| Highland Light | 24,880 | 719 | 5,208 | 103 | 213 | 48 |
| Off Chatham | 261,956 | 8,665 | 86,845 | 2,932 | 3,891 | 548 |
| Seal Island | 3,758 | 49 | | | 300 | 88 |
| Shore, general | 2,617,830 | 51,810 | 912,792 | 21,678 | 7,315 | 842 |
| Total | 10,110,660 | 236,432 | 4,316,465 | 98,036 | 1,103,920 | 114,262 |

QUANTITY AND VALUE OF CERTAIN FISHERY PRODUCTS LANDED AT BOSTON AND GLOUCESTER, MASS., BY AMERICAN FISHING VESSELS DURING THE CALENDAR YEAR 1913, SHOWN BY FISHING GROUNDS—Continued.

| Fishing grounds. | Mackerel. | | Miscellaneous. | | Total. | | (Grand total. | | |
|-----------------------------|-----------|--------|----------------|--------|---------|--------|---------------|---------|--------|
| | Fresh. | | Salted. | | Fresh. | | | Salted. | |
| | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | | Pounds. | Value. |
| LANDED AT BOSTON. | | | | | | | | | |
| East of 68° west longitude. | | | | | | | | | |
| La Have Bank..... | | | | | | | | | |
| Western Bank..... | | | | | | | | | |
| Queen Bank..... | | | | | | | | | |
| Green Bank..... | | | | | | | | | |
| Grand Bank..... | | | | | | | | | |
| Off Newfoundland..... | | | | | | | | | |
| Cape Shore..... | | | | | | | | | |
| Gulf of St. Lawrence..... | | | | | | | | | |
| St. Ann's Bank..... | | | | | | | | | |
| West of 68° west longitude. | | | | | | | | | |
| Browns Bank..... | | | | | | | | | |
| Georges Bank..... | | | | | | | | | |
| Quebec Bank..... | | | | | | | | | |
| Clark Bank..... | | | | | | | | | |
| Fippenes Bank..... | | | | | | | | | |
| Tullis Bank..... | | | | | | | | | |
| Middle Bank..... | | | | | | | | | |
| Pavia Bank..... | | | | | | | | | |
| Jedroys Lodge..... | | | | | | | | | |
| Jedroys Bay..... | | | | | | | | | |
| South Channel..... | | | | | | | | | |
| Nantuxet Shoals..... | | | | | | | | | |
| Off Highland Light..... | | | | | | | | | |
| Off Chatham..... | | | | | | | | | |
| Bay of Fundy..... | | | | | | | | | |
| Seal Island..... | | | | | | | | | |
| Shore, general..... | | | | | | | | | |
| Total..... | | | | | | | | | |

LANDED AT GLOUCESTER.

East of 68° west longitude.

| | | | | | | | | | | | |
|-----------------------------|-----------|---------|------------|--------|-----------|-------------|-----------|------------|---------|-------------|-----------|
| La Have Bank..... | ..... | ..... | 200 | 23 | ..... | 2,233,980 | 49,601 | 95,640 | 3,076 | 2,329,020 | 52,677 |
| Western Bank..... | ..... | ..... | ..... | ..... | ..... | 5,311,782 | 109,618 | 362,832 | 13,920 | 5,677,715 | 128,538 |
| Quebec Bank..... | ..... | ..... | ..... | ..... | ..... | 1,290,842 | 61,641 | 1,182,812 | 47,263 | 2,474,654 | 108,904 |
| Green Bank..... | ..... | ..... | ..... | ..... | ..... | 428,614 | 41,521 | 428,739 | 8,042 | 491,553 | 40,583 |
| Grand Bank..... | ..... | ..... | 460 | 41 | ..... | 981,708 | 53,996 | 4,206,133 | 174,058 | 5,186,841 | 228,064 |
| St. Peter's Bank..... | ..... | ..... | ..... | ..... | ..... | 176,473 | 8,572 | 31,220 | 1,915 | 207,763 | 10,487 |
| Beaulieu Bank..... | ..... | ..... | ..... | ..... | ..... | 1,038,750 | 46,215 | 13,501,582 | 319,773 | 15,130,332 | 395,987 |
| Off Newfoundland..... | ..... | ..... | 61,028,750 | 46,315 | 9,675,376 | 159,833 | ..... | ..... | ..... | ..... | ..... |
| Cape North..... | ..... | ..... | ..... | ..... | ..... | 1,075,696 | 28,181 | 2,164,861 | 80,835 | 3,740,457 | 109,016 |
| Cape Shore..... | ..... | ..... | 259,000 | 15,540 | ..... | 1,831,941 | 49,046 | 2,551,833 | 26,782 | 2,133,794 | 75,808 |
| Gulf of St. Lawrence..... | ..... | ..... | 149,000 | 14,716 | ..... | 1,680,830 | 28,508 | 674,589 | 37,728 | 1,955,219 | 66,236 |
| St. Anna Bank..... | ..... | ..... | ..... | ..... | ..... | 95,235 | 1,657 | ..... | ..... | 95,235 | ..... |
| The Gully..... | ..... | ..... | ..... | ..... | ..... | 162,400 | 10,150 | 38,897 | 1,676 | 201,297 | 11,826 |
| Labrador Coast..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,039,150 | 64,140 | 1,039,150 | 64,140 |
| West of 68° west longitude. | | | | | | | | | | | |
| Browns Bank..... | ..... | ..... | 540 | 54 | ..... | 1,418,083 | 29,524 | 535,512 | 22,598 | 2,003,595 | 52,122 |
| Georges Bank..... | ..... | ..... | 6,796 | 622 | ..... | 4,022,601 | 86,550 | 2,595,486 | 106,626 | 7,518,087 | 193,175 |
| Cashes Bank..... | ..... | ..... | ..... | ..... | ..... | 249,357 | 2,506 | 113,800 | 6,282 | 249,357 | 2,848 |
| Middle Bank..... | ..... | ..... | ..... | ..... | ..... | 50,350 | 2,506 | ..... | ..... | 164,150 | 8,788 |
| Ipswich Bay..... | ..... | ..... | 519,000 | 5,266 | ..... | 905,800 | 21,514 | ..... | ..... | 905,800 | 21,514 |
| South Channel..... | ..... | ..... | ..... | ..... | ..... | 120,942 | 1,675 | ..... | ..... | 120,942 | 1,675 |
| Nantucket Shoals..... | ..... | ..... | 2,100 | 252 | ..... | 133,210 | 4,382 | 664,000 | 46,933 | 797,210 | 51,305 |
| Off Chatham..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4,600 | 403 | ..... | ..... |
| Bay of Fundy..... | ..... | ..... | ..... | ..... | ..... | 35,200 | 361 | ..... | ..... | 35,200 | 361 |
| South..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 400 | 20 | ..... | ..... |
| Shore, general..... | ..... | ..... | ..... | ..... | ..... | 17,685,639 | 384,442 | 76,525 | 4,064 | 17,762,164 | 388,506 |
| Total..... | 574,151 | 29,157 | 1,257,600 | 97,816 | 68,978 | 41,767,740 | 1,027,452 | 28,097,452 | 967,013 | 60,865,192 | 1,994,465 |
| Grand total..... | 4,292,602 | 252,450 | 1,383,400 | 94,618 | 296,917 | 133,970,284 | 4,008,496 | 28,246,502 | 974,521 | 162,216,786 | 4,983,017 |

West of 68° west longitude.

| | | | | | | | | | | | |
|-----------------------|-----------|---------|-----------|--------|---------|-------------|-----------|------------|---------|-------------|-----------|
| Browns Bank..... | ..... | ..... | 540 | 54 | ..... | 1,418,083 | 29,524 | 535,512 | 22,598 | 2,003,595 | 52,122 |
| Georges Bank..... | ..... | ..... | 6,796 | 622 | ..... | 4,022,601 | 86,550 | 2,595,486 | 106,626 | 7,518,087 | 193,175 |
| Cashes Bank..... | ..... | ..... | ..... | ..... | ..... | 249,357 | 2,506 | 113,800 | 6,282 | 249,357 | 2,848 |
| Middle Bank..... | ..... | ..... | ..... | ..... | ..... | 50,350 | 2,506 | ..... | ..... | 164,150 | 8,788 |
| Ipswich Bay..... | ..... | ..... | 519,000 | 5,266 | ..... | 905,800 | 21,514 | ..... | ..... | 905,800 | 21,514 |
| South Channel..... | ..... | ..... | ..... | ..... | ..... | 120,942 | 1,675 | ..... | ..... | 120,942 | 1,675 |
| Nantucket Shoals..... | ..... | ..... | 2,100 | 252 | ..... | 133,210 | 4,382 | 664,000 | 46,933 | 797,210 | 51,305 |
| Off Chatham..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4,600 | 403 | ..... | ..... |
| Bay of Fundy..... | ..... | ..... | ..... | ..... | ..... | 35,200 | 361 | ..... | ..... | 35,200 | 361 |
| South..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 400 | 20 | ..... | ..... |
| Shore, general..... | ..... | ..... | ..... | ..... | ..... | 17,685,639 | 384,442 | 76,525 | 4,064 | 17,762,164 | 388,506 |
| Total..... | 574,151 | 29,157 | 1,257,600 | 97,816 | 68,978 | 41,767,740 | 1,027,452 | 28,097,452 | 967,013 | 60,865,192 | 1,994,465 |
| Grand total..... | 4,292,602 | 252,450 | 1,383,400 | 94,618 | 296,917 | 133,970,284 | 4,008,496 | 28,246,502 | 974,521 | 162,216,786 | 4,983,017 |

^a Herring. Other items under "Miscellaneous" include bluebacks, 1,660,600 pounds, value \$14,187; butterfish, 46,167 pounds, value \$1,192; catfish or wolfish, 5,026 pounds, value \$151; flounders, 400,314 pounds, value \$13,334; herring, 291,700 pounds, value \$3,738; redfish, 15,963 pounds, value \$276; shad, 308,020 pounds, value \$4,215; sharks, 3,505 pounds, value \$88; skates, 8,705 pounds, value \$141; swordfish, fresh, 2,375,920 pounds, value \$105,727; swordfish, salted, 5,000 pounds, value \$50; livers, 751,360 pounds, value \$9,343; sounds, 63,665 pounds, value \$3,809; and spawn, 10,964 pounds, value \$771.

As regards the sources of the fish on which this large industry depends, it may be noted that 67.52 per cent of the quantity and 65.45 per cent of the value were obtained from fishing grounds lying directly off the coast of United States; 13.28 per cent of the quantity and 13.5 per cent of the value from fishing banks off the coast of Newfoundland; 18.55 per cent of the quantity and 19.75 per cent of the value from grounds off the Canadian Provinces; and less than 1 per cent of the quantity and 1.28 per cent of the value from the coast of Labrador. Newfoundland herring constituted 7.06 per cent of the quantity and 4.21 per cent of the value of the products of the vessel fisheries of these ports. The herring were taken on the treaty coast of Newfoundland, but cod and other species from that region were obtained chiefly from fishing banks on the high seas. The fish caught by American fishing vessels off the Canadian Provinces were all from offshore fishing grounds. The catch from each of these fishing regions is given in detail in the following table:

QUANTITY AND VALUE OF FISH LANDED BY AMERICAN FISHING VESSELS AT BOSTON AND GLOUCESTER, MASS., IN 1913, FROM GROUNDS OFF THE COASTS OF THE UNITED STATES, NEWFOUNDLAND, AND CANADIAN PROVINCES.

| Species. | United States. | | Newfoundland. ^a | | Canadian Provinces. | | Total. | |
|----------------|----------------|-----------|----------------------------|---------|---------------------|-----------|-------------|-----------|
| | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. | Pounds. | Value. |
| Cod: | | | | | | | | |
| Fresh..... | 20,856,300 | \$718,354 | 188,645 | \$3,790 | 8,132,286 | \$199,921 | 29,177,231 | \$922,065 |
| Salted..... | 2,795,586 | 122,766 | 8,640,942 | 360,780 | 4,251,064 | 169,264 | 15,687,582 | 652,810 |
| Cusk: | | | | | | | | |
| Fresh..... | 3,292,635 | 58,258 | 20,875 | 311 | 2,502,179 | 40,717 | 5,815,689 | 99,286 |
| Salted..... | 66,271 | 1,432 | 10,351 | 231 | 66,925 | 1,519 | 143,547 | 3,182 |
| Haddock: | | | | | | | | |
| Fresh..... | 46,783,382 | 1,322,980 | 2,050 | 19 | 6,650,364 | 161,725 | 53,435,796 | 1,484,724 |
| Salted..... | 148,207 | 2,283 | 28,335 | 428 | 60,327 | 921 | 236,869 | 3,632 |
| Hake: | | | | | | | | |
| Fresh..... | 10,218,731 | 231,631 | 139,758 | 1,591 | 3,381,499 | 52,970 | 13,739,988 | 286,192 |
| Salted..... | 26,353 | 491 | 148,072 | 2,352 | 171,077 | 2,899 | 245,502 | 5,712 |
| Pollock: | | | | | | | | |
| Fresh..... | 14,682,395 | 252,844 | 1,740 | 15 | 347,033 | 5,134 | 15,031,168 | 257,993 |
| Salted..... | 160,217 | 2,419 | 19,829 | 298 | 56,187 | 847 | 236,233 | 2,564 |
| Halibut: | | | | | | | | |
| Fresh..... | 803,732 | 85,585 | 1,457,984 | 112,199 | 2,494,845 | 211,085 | 4,756,561 | 406,869 |
| Salted..... | 2,339 | 227 | 467,259 | 45,124 | 61,995 | 5,584 | 531,593 | 50,935 |
| Mackerel: | | | | | | | | |
| Fresh..... | 3,251,502 | 186,914 | ..... | ..... | 1,041,100 | 65,536 | 4,292,602 | 252,450 |
| Salted..... | 916,000 | 60,822 | ..... | ..... | 467,400 | 33,796 | 1,383,400 | 94,618 |
| Herring: | | | | | | | | |
| Fresh..... | 291,700 | 3,798 | 1,778,750 | 49,965 | ..... | ..... | 2,070,450 | 53,703 |
| Salted..... | ..... | ..... | 9,676,776 | 159,918 | ..... | ..... | 9,676,776 | 159,918 |
| Swordfish: | | | | | | | | |
| Fresh..... | 2,039,323 | 164,571 | 460 | 41 | 336,137 | 31,115 | 2,375,920 | 196,727 |
| Salted..... | ..... | ..... | ..... | ..... | 5,000 | 150 | 5,000 | 150 |
| Miscellaneous: | | | | | | | | |
| Fresh..... | 3,199,819 | 46,300 | ..... | ..... | 75,060 | 1,187 | 3,274,879 | 47,487 |
| Total.... | 109,534,492 | 3,261,615 | 22,581,826 | 737,062 | 30,100,468 | 984,340 | 162,216,786 | 4,983,017 |

^a Includes 599,113 pounds of salted cod, valued at \$21,558; 438,637 pounds of salted halibut, valued at \$42,547; and 1,400 pounds of salted herring, valued at \$35, from the Labrador coast.

The most interesting and uncertain of the New England vessel fisheries is the mackerel. The catch may be said to have been a failure since 1886, for in no year since then has the yield even approximated that of the preceding years. In 1913 there was some improvement over the previous year, and the catch amounted to 48,126 barrels sold fresh and 7,809 barrels salted. The southern fishery in the spring of 1914 was comparatively successful; and up to June 30 there

was a decided improvement over the corresponding period of 1913. The netters fishing on the shores of the United States and the seiners resorting to the shores of Nova Scotia had a fairly successful season. In June a prominent feature of the fishery was the taking of small mackerel in much larger quantities than for a number of years along the entire coast from Cape Cod to Portland.

Swordfish were more plentiful in 1913 than usual. The entire swordfish fleet did well, and some of the vessels made large catches. On July 4 the schooner *Topsail Girl* landed 242 swordfish, the result of three weeks' fishing, probably the largest number of fish of this species ever brought in by one vessel in one trip; but this record was exceeded on August 4, when the schooner *Edmund F. Black* landed 274 swordfish. The principal fishing ground for vessels in this fishery from Massachusetts and Maine ports is Georges Bank, although large numbers of swordfish are taken along the entire coast from Block Island to the Strait of Canso. The season for this fishery is chiefly from June to September, and Boston is the principal market for the catch. The quantity of swordfish landed at Boston and Gloucester by American fishing vessels in 1913 was 2,375,920 pounds fresh, valued at \$195,727, and 5,000 pounds salted, valued at \$150. Nearly all of the vessels in this fishery are fitted with auxiliary power, which enables them to fish over a large area. The apparatus used is a harpoon.

The winter gill-net fishery, which is carried on at Gloucester and a few other ports on the New England coast, employed about 40 vessels, practically the same number as in 1913. In the early part of the season, i. e., in October and November, the fleet was very successful, large quantities of pollock being taken in a comparatively short time. The catch of cod and haddock by this method, however, was small, and in consequence a number of vessels abandoned the fishery early in the spring. Although a few vessels did fairly well, the fishery as a whole did not compare favorably with the previous year.

The otter-trawl fishery, which centers at Boston, was carried on with greater activity than in previous years. Three new steamers have been added to the fleet since July, 1913, increasing the number to 9, in addition to which one vessel operating out of New York sometimes landed her catch at Boston. The number of trips made by the otter trawlers in 1913 was 326, an increase of 31 over the previous year. The total amount of fish landed at Boston was 14,366,283 pounds, against 15,025,150 pounds landed in 1912, a decrease of 658,867 pounds. The fishery, as in previous years, was chiefly confined to Georges and the South Channel, although during the spring months a number of trips were taken on the Western Bank and a portion of the catch was landed at Portland, Me. The French fleet of otter trawlers, operating on Grand Bank, St. Pierre Bank, and Quereau Bank, consisted of about 30 steamers.

The operations of the Boston trawlers, which had been under investigation during the previous year, were again subjected to close scrutiny, and during the first half of the fiscal year agents of the Bureau were constantly engaged in recording the large and small fish, marketable and unmarketable, taken at each haul of the net. The field

work was suspended in December, although much desirable information still remained to be gathered; and a special committee of Bureau assistants was formed for the purpose of considering the data in hand and of making a general report on the subject of otter trawling. The preparation of the report, for which there has been an insistent demand ever since the investigation began, will be pushed as rapidly as possible.

The new fish pier at Boston, the construction of which was begun in 1912, has been completed, and the 44 fresh-fish firms at T Wharf, where the fresh-fish trade has been carried on for the past 30 years, moved to the new pier on March 29, 1914. The pier is 1,200 feet long and 300 feet wide, and has connected with it a cold-storage plant with a capacity of 1,000,000 pounds of fish. There is also an ice plant from which manufactured ice, either crushed or in cakes, is furnished to the dealers and vessels as needed, being conveyed on motor trucks. The pier is equipped with the latest improvements for conducting the fresh-fish business, and a much greater quantity of fish can be handled daily than was possible at T Wharf. This pier, the best of the kind in the Western Hemisphere, is the most noteworthy improvement in the New England fishing industry in recent years.

MENHADEN INDUSTRY.

The great abundance of menhaden in the coastal waters of the Atlantic seaboard and the peculiar qualities of the fish led many years ago to the inauguration of an industry which in time became an important branch of our fisheries. The taking of menhaden for conversion into oil and fertilizer is now carried on from Maine to Florida, and ranks as one of the leading fisheries of the country. Menhaden caught incidentally in the shore fisheries are utilized also in large quantities as bait in the line fisheries for cod, mackerel, bluefish, and other species, and smaller quantities are used as human food.

A special investigation and statistical canvass of the menhaden industry was undertaken in 1913, and full data for the previous calendar year were obtained by agents who visited every fishing center and every factory. No detailed or complete information had been collected for five years, and no general report on the subject had been issued for many years preceding. Meanwhile, popular interest in the fishery has grown, and local opposition has continued because of a belief that, in fishing for menhaden, great injury is done to other fishes associated with or predatory upon the menhaden.

From the table which follows, it will be seen that in 1912 the menhaden industry gave employment to 3,735 fishermen and 2,159 persons on shore, who received \$1,579,000 in wages. The vessels used numbered 118 steamers and 29 gasoline motors, and 274 purse seines, valued at \$271,000, constituted the sole means of capture. There were in operation 48 factories, a majority of them located in Virginia and North Carolina. The total investment in floating and shore property was over \$7,908,000.

The number of menhaden utilized in the factories was over one billion, valued at \$2,210,000. This catch, which weighed 637 million

pounds, was larger than in any previous year for which statistics are available, and may be regarded as marking a climax, because the following season showed a decided decrease in the available supply of menhaden and a corresponding drop in the product. In addition to the menhaden, about 5 million pounds of sharks, skates, and other waste species caught in the seines, and alewives and other fishes bought from boat fishermen, were consumed at the factories.

The manufactured products consisted of 6,651,000 gallons of oil, valued at \$1,552,000, and over 88,000 tons of scrap, valued at over \$2,100,000.

The vessels engaged in the menhaden fishery consist of steamers, auxiliary schooners, and gasoline boats. The steamers are built somewhat on the tug model, with high bow. The living quarters are forward, while the engine, boilers, and coal bunkers are aft, and the hold is in the center where the deck is low so as to facilitate the transfer of the fish from the net. The auxiliary schooners, most of which are owned in North Carolina, have practically the same arrangement. Many of the steamers now in use are lighted with electricity and have searchlights. The largest one in use in 1912 has a carrying capacity of over a million fish, while a larger one built in 1913, at a cost of \$100,000, has a carrying capacity of one and a half million fish, or 4,500 barrels. The largest gasoline fishing boat is owned in New Jersey, and has a carrying capacity of 400,000 fish. There were 27 steamers built in 1911 and 1912, and several others were in course of construction in 1913. The seine boats are built mostly of cedar, and are 28 to 33 feet long, 6 to 7 feet beam, 2 feet to 2 feet 10 inches deep, and cost \$275 to \$400 each.

The purse seines are generally about 135 to 200 fathoms long, 9 to 10 fathoms deep, with 1½-inch stretched mesh. The "bunt" or center, which is 400 to 500 meshes square, is made of No. 15 and No. 18 cotton twine. The other parts are made of No. 20-9 and No. 20-12 twine. The cork and lead lines are 9 and 12 thread manila rope, and the purse line is 36 thread Russian hemp. The brass rings through which the purse line passes are 4 inches in diameter, and weigh 1½ pounds each; they are attached to the lead line by beackets from 6 to 12 inches long, and are from 3½ to 5 fathoms apart; and the final rings are placed about 10 fathoms from the ends of the net. The corks are 3 to 4½ inches in diameter; the larger ones being placed in the center of the seine in groups of three or four close together. Each seine has from 2,200 to 3,200 corks, costing from \$30 to \$45 a thousand. The cork and lead lines of the seine are tarred, but not the purse line; the net is also tarred once when new.

The method of preserving the seine during the fishing season is by the use of salt. After the day's fishing the seine is stowed in the seine boats, and about 4 bushels of coarse salt are sprinkled over each arm or portion of the seine in each boat. From 12 to 15 buckets of sea water are then poured over the netting in each boat, and as this collects in the bottom of the boats it is pumped into buckets and poured over the twine. This is repeated several times a day while the seine remains in the boats. When the twine is very slimy, as is frequently the case after a haul has been made, it is washed by a stream of water from the fire hose of the steamer. The seines completely rigged for fishing cost about \$1,000 each, and are seldom used more than one season.

The menhaden factories are usually two-story buildings, and are so located as to be accessible to the steamers engaged in the fishery. In addition to the main factory there are several other buildings, including the office, "scrap room" in which the scrap is bagged and stored for shipment, the mess house, and the sleeping quarters for the men. Some of the factories built in recent years have cement floors; many of them are lighted with electricity generated on the premises, and one plant is supplied with electric motors for operating the machinery. The equipment of an average factory consists of an elevator for hoisting the fish out of the vessels, a measuring device, a "raw box," a cooker, presses, a drier, oil tanks, and bucket, chain, or screw conveyors for moving the material from one part of the plant to another. The elevator or other device for removing the fish from the hold of the steamer, and the device for measuring the fish, are always placed on the outer end of the wharf. The cooker is generally on the ground floor, but at some factories is not in the building but on the outside, with a roof to protect it from the weather. The presses are generally placed on the second floor, and the oil tanks at a lower level, so that the oil and water coming from the presses may have a gravity flow. The tanks are frequently outside of the building with no covering, but in most of the northern factories they are under a roof. The drier is on the ground floor, either in the main building or under a shed. The power of the boilers and engines depends on the equipment of the factory. Two 125-horsepower boilers, costing about \$1,500 each, are sufficient for a plant having one cooker, two presses, and one drier. The cost of the entire equipment of such a plant is about \$24,000, and the capacity is about 600,000 fish in a day of 12 hours. The largest factory on the coast has a capacity of about 2,500,000 fish a day and employs upward of 200 men.

The principal processes involved in the manufacture of menhaden oil and fertilizer are cooking and pressing the fish, and drying or otherwise preserving the scrap. It is desirable to cook the fish as soon as practicable after they are caught. Cooking was formerly done almost entirely in vats or tanks fitted at the bottom with perforated pipes by means of which steam was supplied to heat the water in which the fish were placed. The usual time for cooking the fish in these tanks is about 20 minutes. In recent years continuous steam cookers, in which the cooking is done by direct steam, have been gradually displacing the old style vats, and the latter are now used only in North Carolina. After the fish are cooked, the oil is pressed from them by either hydraulic or screw presses. The old-style curbs and hydraulic presses have been displaced to a considerable extent by the screw presses, but are still in use in a number of factories. In drying the scrap it was formerly the custom to spread it on a platform made of boards or concrete where it was exposed to the action of the sun for several days until dry. This method is still employed to some extent, but the hot-air drier is now generally used. Several of the factories have as adjuncts plants for the preparation of fish fertilizer, but the greater part of the scrap is sold to the fertilizer mixing plants. The oil is practically all sold to the dealers in New York, New Bedford, Baltimore, and Boston, where it is refined and graded.

MENEADEN INDUSTRY OF THE ATLANTIC COAST STATES IN 1912.

| Items. | Connecticut and New Yorks | | New Jersey and Delaware. | | Virginia. ^b | | North Carolina and Florida. | | Total. | |
|-------------------------------|---------------------------|-----------|--------------------------|-----------|------------------------|-----------|-----------------------------|----------|---------|-----------|
| | Number. | Value. | Number. | Value. | Number. | Value. | Number. | Value. | Number. | Value. |
| PERSONS AND WAGES. | | | | | | | | | | |
| Persons engaged: | | | | | | | | | | |
| In offices and factories..... | 576 | | 317 | | 1,010 | | 256 | | 2,169 | |
| On vessels fishing..... | 1,094 | | 357 | | 1,320 | | 464 | | 3,735 | |
| Total..... | 1,670 | | 674 | | 2,330 | | 720 | | 5,894 | |
| Wages paid: | | | | | | | | | | |
| In offices and factories..... | | \$224,711 | | \$78,228 | | \$198,737 | | \$49,158 | | \$500,834 |
| On vessels fishing..... | | 388,218 | | 112,769 | | 426,832 | | 80,331 | | 1,018,150 |
| Total..... | | 632,929 | | 190,997 | | 625,569 | | 129,489 | | 1,578,984 |
| INVESTMENT. | | | | | | | | | | |
| Cash or working capital..... | | 101,679 | | 83,184 | | 197,842 | | 78,700 | | 471,405 |
| Factories..... | 8 | 1,400,119 | 7 | 509,401 | 20 | 1,307,128 | 13 | 409,335 | 48 | 3,626,983 |
| Vessels: | | | | | | | | | | |
| Steam..... | 39 | 1,103,500 | 12 | 338,000 | 62 | 1,737,592 | 5 | 124,200 | 118 | 3,803,292 |
| Net tonnage..... | 3,984 | | 1,262 | | 6,970 | | 729 | | 12,945 | |
| Gasoline..... | | | 2 | 25,000 | 1 | 2,000 | 26 | 126,500 | 29 | 153,500 |
| Net tonnage..... | | | 26 | | 33 | | 562 | | 621 | |
| Purse seines..... | 78 | 78,000 | 35 | 34,000 | 121 | 123,000 | 40 | 36,000 | 274 | 271,000 |
| Seine and striker boats..... | 117 | 26,015 | 42 | 9,010 | 189 | 37,335 | 38 | 10,775 | 386 | 83,135 |
| Total..... | | 2,709,313 | | 1,008,595 | | 3,404,897 | | 785,510 | | 7,908,315 |
| EXPENSES. | | | | | | | | | | |
| Taxes and insurance..... | | 51,473 | | 30,311 | | 65,064 | | 7,582 | | 154,430 |
| Subsistence of employees..... | | 141,232 | | 35,786 | | 154,266 | | 13,641 | | 344,925 |
| Fuel..... | | 128,323 | | 34,663 | | 200,333 | | 40,688 | | 404,007 |
| Shipping packages..... | | 58,813 | | 26,772 | | 51,836 | | 4,779 | | 146,200 |
| Acids..... | | 6,115 | | 3,946 | | | | 750 | | 10,811 |
| Total..... | | 385,956 | | 134,478 | | 471,499 | | 67,440 | | 1,059,373 |

^a Includes 1 factory in Maine operated only a few weeks during 1912 and a floating factory now dismantled, both owned by a New York company.

^b Includes 1 small factory in Maryland.

^c Includes buildings, grounds, wharves, machinery, horses, wagons, and small boats used about the factories.

^d Total for factories and vessels.

MENHADEN INDUSTRY OF THE ATLANTIC COAST STATES IN 1912—Continued.

| Item. | Connecticut and New York. ^a | | New Jersey and Delaware. | | Virginia. ^b | | North Carolina and Florida. | | Total. | |
|---|--|-----------|--------------------------|-----------|------------------------|-----------|-----------------------------|----------|---------------|-------------|
| | Number. | Value. | Number. | Value. | Number. | Value. | Number. | Value. | Number. | Value. |
| FISH HANDLED AT FACTORIES. | | | | | | | | | | |
| Menhaden: | | | | | | | | | | |
| Caught by own vessels..... | 307,708,000 | \$657,869 | 108,635,900 | \$232,242 | 471,421,000 | \$987,146 | 69,952,500 | \$95,903 | 957,017,300 | \$2,003,160 |
| Bought from other vessels..... | 9,507,300 | 17,034 | 28,531,600 | 56,928 | 38,740,050 | 76,614 | 14,393,500 | 28,351 | 91,222,450 | 178,927 |
| Bought from shore or boat fisheries..... | 190,400 | 336 | 11,000,000 | 24,050 | 900,000 | 1,800 | 1,513,900 | 1,892 | 13,604,000 | 28,078 |
| Total..... | 317,405,700 | 705,239 | 148,517,400 | 313,220 | 511,061,050 | 1,065,560 | 84,859,900 | 126,146 | 1,061,843,750 | 2,210,165 |
| Other species: | | | | | | | | | | |
| Scrap fish and alewife cuttings, pounds.. | | | | | | | | | | |
| Sea robins..... | | | | | 4,900,000 | 59,404 | | | 4,900,000 | 59,404 |
| States and swellfish..... | 30,000 | 68 | | | | | | | 30,000 | 68 |
| Sharks..... | 150,000 | 225 | | | | | 16,000 | 50 | 150,000 | 225 |
| Total..... | 180,000 | 293 | | | 4,900,000 | 59,404 | 16,000 | 50 | 5,096,000 | 59,747 |
| Grand total..... | | 705,532 | | 313,220 | | 1,124,964 | | 126,196 | | 2,269,912 |
| MANUFACTURED PRODUCTS. | | | | | | | | | | |
| Oil..... | 3,613,500 | 838,216 | 957,337 | 247,831 | 1,907,083 | 426,948 | 173,283 | 38,995 | 6,651,203 | 1,551,990 |
| Dry scrap..... | 2,242 | 68,255 | 2,923 | 91,740 | 40,255 | 1,208,321 | 5,465 | 164,678 | 50,865 | 1,532,994 |
| Accumulated scrap..... | 26,132 | 416,048 | 9,744 | 158,874 | | | 1,660 | 28,524 | 37,536 | 908,446 |
| Crude or green scrap..... | | | 99 | 1,725 | | | | | 99 | 1,725 |
| Total..... | | 1,322,519 | | 500,170 | | 1,635,269 | | 232,197 | | 3,090,185 |

^a Includes 1 factory in Maine operated only a few weeks during 1912 and a floating factory now dismantled, both owned by a New York company.^b Includes 1 factory in Maryland.^c 637,106,290 pounds.^d Consists chiefly of alewife cuttings from packing houses; scrap fish are alewives and perch bought from pound-net fishermen.

STURGEON FISHERY OF DELAWARE RIVER.

A special inquiry regarding the sturgeon and sturgeon fishery of the Delaware River was made by the Commissioner in June, 1914. Notwithstanding a tremendous decline from the conditions prevailing between 1890 and 1900, the Delaware continues to be the leading sturgeon stream of the country.

The fishing centers at Delaware City, Del., and the active season is from about May 25 to July 1. Some sturgeon with large roe are caught as late as September, but a large proportion of such fish are of the small species (*Acipenser brevirostris*) locally called "bottle-nose."

In 1914 the fishery was conducted by 135 boats, each carrying 2 men and a gill net. A sturgeon boat, with net and other equipment, is valued at \$400. The boats belonged in three States, 59 being in Delaware, 69 in New Jersey, and 7 in Pennsylvania. The largest number of boats hailed from Port Penn, Del., but Bayside, Pennsville, and Pennsgrove, N. J., and Delaware City and Cedar Creek, Del., also had good-sized fleets.

The season of 1914 was the best in five to seven years, and, according to local fishermen, the conditions affecting the fishery are gradually improving owing to the discontinuance of early fishing at the Capes of the Delaware and in the lower bay and to protective legislation affecting the fishing in the river. This has permitted a fair percentage of the fish to reach the spawning grounds; and in 1914, up to the first of June, from 50 to 60 per cent of the cow sturgeon caught were spent.

The sturgeon is now so valuable that a boat which takes 6 to 10 fish in a season will pay expenses. In 1914, the price of roe, after being put through a sieve or "rubbed out," averaged \$1.50 a pound and ranged as high as \$1.75 a pound. The carcass, after decapitation, skinning, and evisceration, brought 12 to 20 cents a pound.

A fish brought into Delaware City on May 22, 1914, produced 86 pounds of rubbed-out roe and netted the fisherman \$179.82; and another taken on the same day had 80 pounds of roe and sold for \$145.50. On May 28 a Delaware City fisherman caught a fish 12 feet 3 inches long that weighed 450 pounds gross; the ovaries weighed 125 pounds, and the screened roe weighed 99½ pounds. This fish, which was of exceptionally large size for recent years, brought the fisherman \$178. Another fish taken on the same day had 85½ pounds of roe.

There now exists among the Delaware River fishermen a strong sentiment in favor of adequate protection for the sturgeon.

CONDITION OF THE NORTH CAROLINA FISHERIES.

In view of the active cooperation which for many years has existed between the Bureau of Fisheries and the North Carolina officials having charge of fishery matters, and because of the aid which has been given to the local fisheries by the work of artificial propagation on Albemarle Sound and tributaries, a brief review of the situation is appropriate at this time.

The history of the fisheries of North Carolina is similar to that of most other communities in which the regulation of the industry has been in obedience to local demands, prejudices, and jealousies rather than based on broad principles having in view the interests of the State as a whole and a proper regard for the future welfare of both the fisherman and the consumer. There was at first a gradual increase in the yield, owing to the growth of markets and the improvement of means of transportation, the demand thus stimulated resulting in an increase in the number of persons and the quantity of apparatus employed. For a period this increase in the intensity of the fishery had no very conspicuous influence on the apparent abundance of the fishes, the effects being further obscured in the view of the fishermen by an increase in the unit price of the products, due to broader markets. Eventually, however, the decrease in the fishes began to manifest itself in the catch, and this was most conspicuous in the more desirable and higher-priced species like the shad. From 1880, the earliest year for which data are available, the catch of this species gradually increased under the operation of the factors just mentioned, but after attaining a maximum about 1897 it declined rapidly and in 1904 had sunk to the level of 1880. Essentially the same conditions obtained with respect to other species, although the catch of food fish as a whole was well maintained because many of the cheaper fish, justly or unjustly regarded as inferior, which in the earlier period were but little utilized, at a later date came into greater demand and found a market which the fishermen could supply with profit.

About the time the decrease in the shad became critical and was imposing a serious decrease in the profits of the fishermen, an inquiry was instituted by the Bureau of Fisheries which demonstrated that the most important, if not practically the sole, cause of the decrease was the excessive use of fishing apparatus of all kinds, fished promiscuously in the inlets, channels, and sounds so as to effectually block the passage of the shad and other anadromous fishes to their spawning grounds.

Moved by a consideration of these facts, the legislature of North Carolina, in 1905, passed an act, popularly known as the Vann bill, which prohibited fishing in certain of the inlets leading from the sea to the sounds, and restricted the use of pound nets in the upper part of Pamlico Sound and all of Croatan, Roanoke, and Albemarle Sounds to certain prescribed zones. As amended in 1909, this law now preserves from all nets a strip of varying width extending from the ocean inlets to and up the rivers discharging into Albemarle Sound.

There is thus created a broad avenue in which the shad and other anadromous fishes may travel without obstruction from the sea to their spawning places in the rivers. The effect of this has become increasingly apparent and perhaps may be illustrated best by the history of the operations of the Bureau's hatchery at Edenton, N. C., at the end of Albemarle Sound. The station was established in 1889 for the utilization of the eggs from shad resorting to the spawning beds in Chowan River and the adjacent parts of the sound. Its first year of effective operation was 1901, when 75,400,000 eggs were taken. In 1902 the take fell to 37,987,000, and by 1905 the number of eggs

secured had fallen by stages to 6,748,000. In 1906, the year in which the Vann bill became effective, 25,643,000 eggs were taken; in 1909 the take was 59,685,000; in 1913 it had risen by rapid stages to 138,912,000, and even this number could have been exceeded if the capacity of the hatchery at that time had permitted the eggs to be handled. The season of 1914 showed a temporary decline owing to unfavorable weather conditions.

The shad fishery in Albemarle Sound in 1913 was generally said to be the greatest for many years, if not in the history of the locality. The facts are a vindication of both rational legislation and shad culture. The hatchery was ineffective so long as the fish were prevented from reaching the spawning beds where ripe eggs may be obtained, but as soon as an unobstructed way was opened by the enforcement of a reasonable law, its operations could be conducted on a scale sufficient to warrant expectation of economic results. The effects of the heavier plants of recent years are in turn manifested both in the increase in the product of the fishery and in the number of eggs obtainable.

Fortified by the conspicuously good effects which followed the passage of the Vann law, the friends of fishery conservation in North Carolina have been endeavoring to have its essential features extended to all maritime parts of the State, and the movement to that end has been supported and aided by the Bureau. In 1906 a canvass of the shad fisheries of the State was made by an agent of the Bureau, and practically every year since then an assistant has been detailed to assist and advise in the campaign which has been waged. Although the desired legislation has not been enacted, each year has shown a greater willingness of the fishery interests of most parts of the State to break away from the ineffective and pernicious system of county control and special local regulation, and to adopt the broad principles of State administration, without which no effective laws can be drafted or enforced.

FRESH-WATER MUSSEL FISHERY.

A general canvass of the fresh-water mussel fishery has been undertaken, and during the year waters tributary to the Gulf of Mexico from the Ohio River southward were covered for the calendar year 1912. This fishery supplies the raw materials used in the pearl-button industry and yields also pearls. Nearly all the shells obtained are utilized in the United States, but small quantities are exported to Canada and Europe. The increasing demand for shells has resulted in the extension of the fishery into streams far remote from button factories.

The following statistics for the region indicated were originally issued as a special bulletin that was extensively distributed. Over 4,800 persons were engaged in taking the mussels and preparing them for market; and their boats, apparatus of capture, and accessory property was valued at \$241,000. The shells were obtained principally with the appliance known as the crowfoot bar, which is peculiar to this fishery. The output was nearly 20,000 tons, for which the fishermen received \$294,600. The pearls found in the mussels, which were for the most part only an incidental item, were valued at \$149,000.

FRESH-WATER MUSSEL FISHERY OF STREAMS TRIBUTARY TO THE GULF OF MEXICO FROM THE OHIO RIVER SOUTHWARD IN 1912.

| Items. | Big Sunflower River. | | Black River and minor tributaries. | | Caddo Lake. | | Clinch River. | | Cumberland River. | | Duck River. | | Green River. | | Holston River. | |
|--|----------------------|--------|------------------------------------|---------|-------------|--------|---------------|--------|-------------------|--------|-------------|--------|--------------|--------|----------------|--------|
| | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. |
| Persons engaged: | | | | | | | | | | | | | | | | |
| Fishermen..... | 24 | | 680 | | 200 | | 60 | | 150 | | 25 | | 12 | | 25 | |
| Transporters..... | | | 11 | | | | 2 | | 7 | | | | | | | |
| Shoremen..... | | | 4 | | | | | | 26 | | | | 2 | | | |
| Total..... | 24 | | 695 | | 200 | | 62 | | 186 | | 25 | | 14 | | 25 | |
| Fishermen, classified by methods used: | | | | | | | | | | | | | | | | |
| Crowfoot bars..... | 15 | | 55 | | | | | | 115 | | | | 12 | | 15 | |
| Tongs..... | 22 | | 485 | | | | | | | | | | | | | |
| Forks..... | | | 9 | | | | | | | | | | | | | |
| Rakes..... | | | 21 | | | | | | | | | | | | | |
| Dredges..... | | | 20 | | | | | | | | | | | | | |
| Waders..... | | | 202 | | 6200 | | 60 | | 35 | | 25 | | | | 10 | |
| Total, exclusive of duplication..... | 24 | | 680 | | 200 | | 60 | | 150 | | 25 | | 12 | | 25 | |
| Boats and vessels: | | | | | | | | | | | | | | | | |
| Rowboats and barges..... | 24 | \$120 | 625 | \$3,245 | 100 | \$250 | 60 | \$200 | 115 | \$902 | | | 12 | \$60 | 25 | \$75 |
| Gasoline boats..... | | | 41 | 5,410 | | | | | 19 | 3,425 | | | | | | |
| House boats..... | 1 | 100 | 122 | 10,305 | | | | | 2 | 100 | | | | | | |
| Vessels transporting..... | | | 3 | 2,140 | | | | | 2 | 4,700 | | | | | | |
| Total..... | 25 | 220 | 791 | 21,100 | 100 | 250 | 60 | 200 | 138 | 9,127 | | | 12 | 60 | 25 | 75 |
| Apparatus: | | | | | | | | | | | | | | | | |
| Crowfoot bars..... pairs..... | 15 | 75 | 55 | 504 | | | | | 100 | 1,243 | | | 12 | 170 | 15 | 105 |
| Tongs..... | 22 | 110 | 461 | 2,894 | | | | | | | | | | | | |
| Forks..... | | | 9 | 9 | | | | | | | | | | | | |
| Rakes..... | | | 21 | 58 | | | | | | | | | | | | |
| Dredges..... | | | 10 | 500 | | | | | | | | | | | | |
| Total..... | | 185 | | 3,965 | | | | | | 1,243 | | | | 170 | | 105 |
| Shore and accessory property..... | | 10 | | 2,042 | | 65 | | 15 | | 866 | | \$25 | | 15 | | 15 |
| Total investment..... | | 415 | | 27,107 | | 315 | | 215 | | 11,236 | | 25 | | 245 | | 195 |

| PRODUCTS. | | | | | | | | | |
|---------------------------------------|-------|--------|-------|--------|---|-------|--------|-------|--------|
| Shells: | 40 | 400 | 104 | 1,977 | ..... | ..... | ..... | ..... | ..... |
| With crowfoot bars..... | 120 | 1,200 | 1,138 | 19,100 | ..... | ..... | ..... | ..... | ..... |
| With tons..... | ..... | ..... | 15 | 201 | ..... | ..... | ..... | ..... | ..... |
| With forks..... | ..... | ..... | 24 | 379 | ..... | ..... | ..... | ..... | ..... |
| With rakes..... | ..... | ..... | 53 | 1,072 | ..... | ..... | ..... | ..... | ..... |
| With dredges..... | ..... | ..... | 62 | 1,267 | ..... | ..... | ..... | ..... | ..... |
| With hands..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Total..... | 160 | 1,600 | 1,396 | 23,996 | ..... | ..... | ..... | ..... | ..... |
| Pearls..... | ..... | 112 | ..... | 44,730 | ..... | ..... | ..... | ..... | ..... |
| Total value of products..... | ..... | 1,712 | ..... | 68,726 | ..... | ..... | ..... | ..... | ..... |
| Persons engaged: | | | | | | | | | |
| Fishermen..... | No. | Value. | No. | Value. | Little River (branch of St. Francis River). | No. | Value. | No. | Value. |
| Transporters..... | 2 | ..... | 37 | ..... | ..... | ..... | ..... | ..... | ..... |
| Shoemen..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Total..... | 2 | ..... | 37 | ..... | ..... | ..... | ..... | ..... | ..... |
| Fishermen, classified by method used: | | | | | | | | | |
| Crowfoot bars..... | ..... | ..... | 21 | ..... | ..... | ..... | ..... | ..... | ..... |
| Tongs..... | ..... | ..... | 37 | ..... | ..... | ..... | ..... | ..... | ..... |
| Forks..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Dredges..... | ..... | ..... | 6 | ..... | ..... | ..... | ..... | ..... | ..... |
| Waders..... | ..... | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... |
| Total, exclusive of duplication..... | 2 | ..... | 37 | ..... | ..... | ..... | ..... | ..... | ..... |
| Boats and vessels: | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Rovibots and barges..... | 2 | \$15 | 37 | \$135 | ..... | ..... | ..... | ..... | ..... |
| Gasoline boats..... | ..... | ..... | 1 | 75 | ..... | ..... | ..... | ..... | ..... |
| Horse boats..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Vessels transporting..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Total..... | 2 | 15 | 38 | 260 | ..... | ..... | ..... | ..... | ..... |

Includes 35 women.

Includes 5 women.

FRESH-WATER MUSSEL FISHERY OF STREAMS TRIBUTARY TO THE GULF OF MEXICO FROM THE OHIO RIVER SOUTHWARD IN 1912—Contd.

| Items. | Little River (branch of Red River). | | Little River (branch of St. Francis River). | | Mustkingum River. | | Neosho River. | | Ohio River and minor tribu- taries. | | Ouachita and Little Missouri Rivers. | | Pearl River. | | Saline River. | |
|-----------------------------------|---|--------|---|--------|----------------------|---------|---------------|--------|---|----------|--|--------|--------------|--------|---------------|--------|
| | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. |
| Apparatus: | | | | | | | | | | | | | | | | |
| Crowfoot bars.....pails. | | | 721 | \$318 | 75 | \$1,005 | | | 1,214 | \$14,936 | 7 | \$60 | | | | |
| Tongs..... | | | 3 | 202 | | | | | 23 | 105 | 30 | 200 | 16 | \$135 | | |
| Forks..... | 2 | \$2 | | | | | 50 | \$75 | 39 | 46 | 29 | 43 | 7 | 8 | | |
| Dredges..... | | | | | | | 1 | 500 | | | | | | | | |
| Total..... | | 2 | | 520 | | 1,005 | | 575 | | 15,087 | | 303 | | 143 | | |
| Shore and accessory property..... | | 5 | | 75 | | 250 | | 305 | | 3,064 | | 49 | | 30 | | \$20 |
| Total investment..... | | 22 | | 855 | | 3,768 | | 1,195 | | 89,650 | | 681 | | 1,313 | | 30 |
| PRODUCTS. | | | | | | | | | | | | | | | | |
| Shells: | | | | | | | | | | | | | | | | |
| With crowfoot bars.....tons. | | | 67 | 545 | 608 | 12,160 | | | 8,218 | 105,112 | 18 | 390 | | | | |
| With tongs.....tons. | | | 189 | 1,845 | | | | | 29 | 528 | 69 | 1,217 | 192 | 1,860 | | |
| With forks.....tons. | 10 | 150 | | | | | 900 | 9,000 | 99 | 1,896 | 100 | 1,428 | 20 | 200 | | |
| With dredges.....tons. | | | | | | | 100 | 1,000 | | | | | | | | |
| With hands.....tons. | 5 | 75 | | | | | 9 | 63 | 2 | 16 | | | | | 67 | 988 |
| Total..... | 15 | 225 | 256 | 2,390 | 608 | 12,160 | 1,009 | 10,063 | 8,348 | 107,542 | 187 | 3,035 | 212 | 2,060 | 67 | 988 |
| Pearls..... | | 25 | | 125 | | 2,115 | | 2,000 | | 11,349 | | 270 | | 200 | | 30 |
| Total value of products..... | | 250 | | 2,515 | | 14,275 | | 12,063 | | 118,891 | | 3,305 | | 2,260 | | 1,018 |

| Items. | St. Francis River. | | Tennessee River. | | Tombigbee River. | | Tuscarawas River. | | White River and minor tributaries. | | Total. | |
|--|--------------------|---------|------------------|---------|------------------|--------|-------------------|--------|------------------------------------|---------|---------|----------|
| | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. |
| Persons engaged: | | | | | | | | | | | | |
| Fishermen. | 280 | 153 | 153 | | 8 | | a 3 | | 1,583 | | 4,665 | |
| Transporters. | 2 | 2 | 12 | | 2 | | | | 42 | 91 | 110 | |
| Shoremen. | 20 | | | | | | | | 13 | | | |
| Total. | 310 | | 166 | | 10 | | 3 | | 1,638 | | b 4,866 | |
| Fishermen, classified by methods used: | | | | | | | | | | | | |
| Crowfoot bars | 149 | | 153 | | 8 | | 3 | | c 951 | | 2,783 | |
| Tongs | 282 | | | | 8 | | | | 336 | | 1,232 | |
| Forks | 6 | | | | | | | | 228 | | 1,364 | |
| Rakes | | | | | | | | | 21 | | 43 | |
| Dredges | | | | | | | | | 17 | | | |
| Waders | | | | | | | | | 513 | | 1,061 | |
| Total, exclusive of duplication. | 290 | | 153 | | 8 | | 3 | | 1,583 | | 4,665 | |
| Boats and vessels: | | | | | | | | | | | | |
| Rowboats and barges | 314 | \$1,632 | 154 | \$2,830 | 10 | \$465 | 3 | \$15 | 1,367 | \$8,626 | 4,276 | \$26,631 |
| Gasoline boats. | 38 | 4,735 | 9 | 2,515 | | | | | 138 | 20,400 | 446 | 59,545 |
| House boats. | 50 | 3,540 | | | | | | | 228 | 16,910 | 579 | 46,960 |
| Vessels transporting | | | 1 | 3,500 | | | | | 6 | 17,150 | 25 | 56,265 |
| Total. | 402 | 9,907 | 164 | 8,845 | 10 | 465 | a 3 | 15 | 1,794 | 63,086 | 5,326 | 189,431 |
| Apparatus: | | | | | | | | | | | | |
| Crowfoot bars. | 159 | 1,618 | 153 | 1,187 | 8 | 65 | a 3 | 66 | 950 | 10,544 | 2,795 | 31,896 |
| Tongs. | 292 | 1,752 | | | 8 | 36 | | | 336 | 1,867 | 1,245 | 7,321 |
| Forks | 6 | 6 | | | | | | | 228 | 238 | 364 | 47 |
| Rakes. | | | | | | | | | | | 71 | 45 |
| Dredges. | | | | | | | | | 8 | 500 | 19 | 1,500 |
| Total. | | 3,376 | | 1,187 | | 101 | | 66 | | 13,169 | | 41,262 |
| Shore and accessory property. | | 883 | | 246 | | 5 | | 5 | | 2,863 | | 10,853 |
| Total investment. | | 14,166 | | 10,278 | | 571 | | 86 | | 79,118 | | 241,486 |

c Includes 3 women.

b Includes 56 women.

a Exclusive of 4 men with boats and crowfoot bars-shown under Muskingum River.

FRESH-WATER MUSSEL FISHERY OF STREAMS TRIBUTARY TO THE GULF OF MEXICO FROM THE OHIO RIVER SOUTHWARD IN 1912—Cont'd.

| Items. | St. Francis River. | Tennessee River. | Tombigbee River. | Tuscarawas River. | White River and minor tributaries. | Total. |
|------------------------------|--------------------|------------------|------------------|-------------------|------------------------------------|------------------|
| | No. Value. | No. Value. | No. Value. | No. Value. | No. Value. | No. Value. |
| PRODUCTS. | | | | | | |
| Shells: | | | | | | |
| With crowfoot bars..... | 291 \$5,719 | 908 \$10,149 | 15 \$150 | 60 \$960 | 2,737 \$55,129 | 14,531 \$210,521 |
| With tongs..... | 904 18,652 | ..... | 40 400 | ..... | 520 10,766 | 3,201 55,568 |
| With forks..... | 15 300 | ..... | ..... | ..... | 118 2,118 | 1,277 15,283 |
| With rakes..... | ..... | ..... | ..... | ..... | ..... | 24 379 |
| With dredges..... | ..... | ..... | ..... | ..... | ..... | 303 5,091 |
| With hands..... | ..... | ..... | ..... | ..... | 150 3,019 | 379 7,764 |
| Total..... | 1,210 24,671 | 908 10,149 | 55 550 | 60 960 | 3,709 75,797 | 19,715 294,606 |
| Pearls..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Total value of products..... | 5,098 | 912 | 80 | 200 | 46,961 | 149,121 |
| | 29,769 | 11,061 | 630 | 1,160 | 122,748 | 443,727 |

FRESH-WATER PEARL BUTTON INDUSTRY OF THE UNITED STATES IN 1912.

| Items. | Alabama and Kentucky. | | Kansas, Arkansas, and Oklahoma. | | Illinois. | | Indiana. | | Iowa. | | Maryland and Pennsylvania. | | Michigan and Minnesota. | |
|---|-----------------------|---------|---------------------------------|----------|-----------|-----------|-----------|----------|-------------|-----------|----------------------------|----------|-------------------------|----------|
| | Male. | Female. | Male. | Female. | Male. | Female. | Male. | Female. | Male. | Female. | Male. | Female. | Male. | Female. |
| Persons engaged: | | | | | | | | | | | | | | |
| Proprietors..... | 10 | | 8 | | 93 | | 25 | | 115 | | 3 | | 14 | |
| Managers..... | 3 | | 5 | | 6 | | 3 | | 30 | | 2 | | 3 | |
| Clerks and agents..... | | 1 | 3 | | 1 | | 1 | | 75 | | 2 | | 1 | |
| Other employees..... | 117 | | 352 | | 563 | | 271 | | 2,227 | | 135 | | 167 | |
| Total..... | 130 | 1 | 368 | 8 | 663 | 62 | 300 | 56 | 2,447 | 1,202 | 142 | 81 | 175 | 1 |
| Wages paid..... | \$38,413 | | \$148,747 | | \$257,551 | | \$120,149 | | \$1,766,933 | | \$37,300 | | \$44,499 | |
| Classification of plants: | | | | | | | | | | | | | | |
| Complete button manufacture..... | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. |
| Cutting only..... | 4 | | 7 | | 36 | | 11 | | 60 | | 1 | | 6 | |
| Finishing and grading only..... | | | | | | | | | 3 | | 2 | | | |
| Grading only..... | | | | | 1 | | | | 1 | | | | | |
| Crushers connected with factories..... | 1 | | 2 | | 3 | | 2 | | 14 | | 1 | | 2 | |
| Independent crushers..... | | | | | | | 1 | | 3 | | | | | |
| Novelty works..... | | | | | | | | | | | | | | |
| Total separate plants..... | 4 | | 7 | | 37 | | 13 | | 76 | | 3 | | 7 | |
| Property: | | | | | | | | | | | | | | |
| Buildings and grounds..... | | \$7,900 | | \$16,000 | | \$300,602 | | \$21,550 | | | | \$23,500 | | \$24,910 |
| Cutting machines..... | 132 | 2,337 | 404 | 6,985 | 605 | 9,579 | 298 | 3,875 | 2,141 | 42,330 | 52 | 780 | 147 | 2,947 |
| Automatic button machines..... | | | | | | | | | 11 | 3,047 | 53 | 10,600 | | |
| Chines (double)..... | | | | | | | 10 | 10,000 | 339 | 462,142 | 15 | 10,000 | 10 | 20,000 |
| All other machinery and equipment..... | | 3,200 | | 8,025 | | 55,237 | | 7,865 | | 198,847 | | 8,300 | | 4,400 |
| Total investment..... | | 13,437 | | 31,020 | | 355,418 | | 43,290 | | 1,104,987 | | 53,180 | | 62,257 |
| Shell products received: | | | | | | | | | | | | | | |
| Shells..... | 1,322 | 18,600 | 4,758 | 105,490 | 7,921 | 131,540 | 3,793 | 55,136 | 27,346 | 565,408 | 753 | 14,034 | 1,528 | 27,266 |
| Blanks (purchased or from branch plants)..... | | | 10,000 | 3,000 | 4,169 | 616 | 60,000 | 8,550 | 7,291,210 | 937,743 | 823,177 | 113,760 | 36,197 | 4,617 |
| Waste shell..... | | | | | | | 660 | 980 | 13,763 | 9,808 | | | 25 | 19 |
| Total..... | | 18,600 | | 108,490 | | 132,156 | | 64,676 | | 1,512,959 | | 127,794 | | 31,902 |
| Shell products consumed: | | | | | | | | | | | | | | |
| Shells..... | 965 | | 3,967 | | 8,079 | | 4,330 | | 26,268 | | 303 | | 1,062 | |
| Blanks..... | | | 10,000 | | | | 60,000 | | 5,591,625 | | 708,077 | | 36,197 | |
| Waste shell..... | 200 | | | | 801 | | 1,945 | | 18,469 | | | | 685 | |

FRESH-WATER PEARL BUTTON INDUSTRY OF THE UNITED STATES IN 1912—Continued.

| Items | Alabama and Kentucky. | | Kansas, Arkansas, and Oklahoma. | | Illinois. | | Indiana. | | Iowa. | | Maryland and Pennsylvania. | | Michigan and Minnesota. | |
|--|-----------------------|----------|---------------------------------|-----------|-----------|-----------|-----------|-----------|------------|-------------|----------------------------|----------|-------------------------|----------|
| | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. |
| Shell products manufactured: | | | | | | | | | | | | | | |
| Buttons ^a gross | 454,627 | | 1,766,150 | | 3,080,507 | | 1,092,761 | | 12,226,471 | | 237,283 | | 268,273 | |
| Blanks ^b do | | | | | | | | | 6,747,784 | | 411,432 | | | |
| By-products..... tons | 200 | | 820 | | 647 | | 1,380 | | 15,092 | | | | 636 | |
| Crushed shell..... do | | | | | 6 | | 400 | | 638 | | | | | |
| Dust..... | | | | | | | | | | | | | | |
| Novelties..... | | | | | | | | | \$43,141 | | | | | |
| Shell products marketed: | | | | | | | | | | | | | | |
| Buttons ^a gross | 454,627 | \$67,454 | 1,660,775 | \$267,408 | 3,101,968 | \$472,937 | 1,092,761 | \$150,080 | 12,646,920 | \$2,846,601 | 237,283 | \$86,547 | 268,273 | \$85,068 |
| Blanks ^b do | | | 52 | 3,483 | | | 13 | 643 | 6,171,571 | 1,065,619 | 411,432 | 57,680 | | |
| Shells for export..... tons | | | | | | | | | 60 | 4,028 | 25 | 1,274 | | |
| By-products..... | | | | | | | | | | | | | | |
| Crushed shell..... do | 200 | 800 | 880 | 4,920 | 597 | 1,825 | 1,460 | 7,020 | 14,844 | 75,408 | | | 187 | 1,569 |
| Waste shell not crushed, tons | 1,040 | 1,040 | 1,485 | 1,485 | 2,196 | 1,007 | 1,610 | 1,533 | 3,247 | 1,846 | 214 | 214 | | |
| Dust..... tons | | | | | 6 | 8 | 105 | 50 | 888 | 2,933 | | | | |
| Novelties..... | | | | | | | | | 43,141 | | | | | |
| Total..... | | 69,294 | | 277,388 | | 475,777 | | 159,305 | | 4,039,636 | | 145,635 | | 36,637 |
| Freight charges paid on buttons, blanks, and shells..... | | 1,000 | | 1,935 | | 2,110 | | 1,572 | | 81,773 | | 5,378 | | 2,169 |

^a The output of buttons for Indiana and Michigan is included with that of Wisconsin, as there is only one complete button factory in each of these three States; the buttons manufactured in Maryland are included with those of New York, where they are polished and graded; and the buttons for Missouri are included with those of Iowa.

^b Includes all blanks except those made at factories where both the blanks and complete buttons are manufactured.

^c Includes blanks cut at branch plants and made into buttons at the button factories.

| Items. | Missouri. | | New Jersey. | | New York and Massachusetts. | | Ohio and West Virginia. | | Tennessee. | | Wisconsin. | | Total. | |
|----------------------------|-----------|----------|-------------|----------|-----------------------------|-----------|-------------------------|----------|------------|----------|------------|----------|-------------|-------------|
| Persons engaged: | Male. | Female. | Male. | Female. | Male. | Female. | Male. | Female. | Male. | Female. | Male. | Female. | Male. | Female. |
| | 21 | 15 | 2 | 2 | 25 | 31 | 4 | 2 | 3 | 1 | 26 | 2 | 358 | 2 |
| | 6 | 4 | 3 | 3 | 7 | 61 | 220 | 2 | 65 | 208 | 206 | 219 | 168 | 78 |
| | 269 | 105 | 165 | 20 | 410 | 822 | 224 | 2 | 69 | 244 | 244 | 221 | 5,157 | 2,611 |
| | 307 | 109 | 183 | 25 | 503 | 853 | 224 | 2 | 69 | 244 | 244 | 221 | 5,755 | 2,621 |
| Wages paid..... | \$126,641 | | \$55,816 | | \$538,324 | | \$101,758 | | \$18,020 | | \$126,537 | | \$3,383,688 | |
| Classification of plants: | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. |
| | 2 | | 3 | | 3 | | 4 | | 3 | | 1 | | 21 | |
| | 8 | | 2 | | 8 | | 4 | | 3 | | 14 | | 153 | |
| | 2 | | | | | | 2 | | | | 4 | | 15 | |
| | 2 | | 1 | | 2 | | 2 | | | | 2 | | 32 | |
| Total separate plants..... | 10 | | 5 | | 12 | | 4 | | 3 | | 15 | | 196 | |
| Property: | | | | | | | | | | | | | | |
| | | \$39,545 | | \$94,000 | | \$531,629 | | \$14,900 | | \$11,700 | | \$52,619 | | \$1,627,476 |
| | 303 | 4,805 | 65 | 2,000 | 116 | 2,400 | 250 | 3,060 | 61 | 1,163 | 182 | 2,720 | 4,756 | 85,021 |
| | 31 | 34,000 | 15 | 21,250 | 52 | 22,000 | | | | | 25 | 37,600 | 116 | 35,647 |
| | | 15,084 | | 9,450 | 329 | 353,861 | | 2,550 | | 1,327 | | 22,275 | 774 | 948,553 |
| Total Investment..... | 93,384 | | 126,700 | | 1,086,564 | | 20,540 | | 14,190 | | 115,214 | | 3,110,181 | |
| Shell products received: | | | | | | | | | | | | | | |
| | 3,776 | 71,948 | 460 | 13,810 | 167 | 5,409 | 3,423 | 50,017 | 708 | 10,378 | 2,182 | 38,706 | 58,135 | 1,107,742 |
| | 200,107 | 26,683 | 127,000 | 27,563 | 9,386,539 | 1,214,897 | | | | | 340,000 | 47,600 | 18,288,399 | 2,885,029 |
| | 1,030 | 773 | | | | | | | | | 110 | 62 | 15,578 | |
| | | 99,404 | | 41,373 | | 1,220,306 | | 50,017 | | 10,378 | | 86,368 | | 3,504,423 |
| Total..... | | | | | | | | | | | | | | |
| Shell products consumed: | | | | | | | | | | | | | | |
| | 2,921 | | 276 | | 329 | | 4,009 | | 686 | | 2,426 | | 55,671 | |
| | 200,107 | | 401,200 | | 10,033,592 | | 966 | | | | 340,160 | | 17,380,968 | |
| | 1,210 | | | | | | | | | | 1,900 | | 26,166 | |
| | | | | | | | | | | | | | | |

FRESH-WATER PEARL BUTTON INDUSTRY OF THE UNITED STATES IN 1912—Continued.

| Items. | Missouri. | | New Jersey. | | New York and Massachusetts. | | Ohio and West Virginia. | | Tennessee. | Wisconsin. | | Total. |
|--|-----------|-----------|-------------|---------|-----------------------------|-----------|-------------------------|-----------|------------|------------|------------|------------|
| | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. | No. | Value. |
| Shell products manufactured: | | | | | | | | | | | | |
| Buttons ^a | | | 541,400 | | 11,223,853 | | 1,125,651 | | 216,504 | 1,677,876 | 25,906,883 | |
| Blanks ^b | 773,149 | | | | 21,871 | | | | | 577,133 | 16,534,842 | |
| By-products— | | | | | | | | | | | | |
| Crushed shell..... | 1,700 | | | | | | 649 | | | 1,975 | 23,099 | |
| Dust..... | | | | | | | 70 | | | | 1,114 | |
| Novelties..... | | | | | | | | | | | | \$61,541 |
| Shell products marketed: | | | | | | | | | | | | |
| Buttons ^a | | | 478,567 | 198,455 | 11,276,287 | 2,678,459 | | | | 1,540,012 | \$363,334 | 26,179,069 |
| Blanks ^c | 757,149 | \$108,999 | | | 20,942 | 1,257 | 1,125,651 | \$171,378 | 216,504 | 575,454 | 77,998 | 15,885,107 |
| Shells for export..... | 757,149 | 608 | | | | | | | | 3 | 125 | 10,161 |
| By-products: | | | | | | | | | | | | |
| Crushed shell..... | 1,700 | 8,550 | | | | | 649 | 3,090 | | 2,013 | 11,540 | 22,530 |
| Waste shell not crushed | | | | | | | | | | | | 114,722 |
| Dust..... | 259 | 128 | | | | | 70 | 70 | 250 | 235 | 42 | 10,536 |
| Novelties..... | | | | | | | | | | 150 | 438 | 7,575 |
| Total..... | | 118,285 | | 198,655 | | 18,500 | | 174,538 | | | | 3,469 |
| Freight charges paid on buttons, blanks, and shells..... | | 4,236 | | 6,404 | | | | | | | | 61,941 |
| | | | | | | | | | | 453,477 | | 8,892,471 |
| | | | | | | | | | | | | 152,159 |

^a The output of buttons for Indiana and Michigan is included with that of Wisconsin, as there is only one complete button factory in each of these three States; the buttons manufactured in Maryland are included with those of New York, where they are polished and graded; and the buttons for Missouri are included with those of Iowa.

^b Includes all blanks except those made at factories where both the blanks and complete buttons are manufactured.

^c Includes blanks cut at branch plants and made into buttons at the button factories.

NOTE.—Ocean shells were handled by seven firms, but the products of these are not included in the statistics.

FRESH-WATER PEARL-BUTTON INDUSTRY.

A statistical canvass of this business was conducted in connection with the fresh-water mussel fishery, and detailed figures for all plants in the United States were obtained for the calendar year 1912. This industry has had an interesting history, and is now being actively aided by the artificial propagation of mussels and by special investigations of mussel resources of various streams. The manufacture of pearl buttons from the shells of fresh-water mussels began in the United States in 1891. The first factory was at Muscatine, Iowa, which soon became and still is an important center of the business. Plants were early established in Illinois, Wisconsin, and other States of the Mississippi Valley; and in 1912 the industry, in some of its branches, was conducted in 20 States.

The results of this canvass, as shown in the table on pages 419 to 422, have already been given to the trade through the medium of a special bulletin. It appears that about 8,400 persons were employed and that over \$3,380,000 were paid in wages. The capital invested in the industry was \$3,110,000, and the output of buttons, blanks, shells for export, and other products was valued at \$8,882,000.

TUNA INDUSTRY OF CALIFORNIA.

The California tuna fishery and the canning industry connected therewith have been the subject of a special inquiry. The recent growth of this branch of the fisheries has been marked, and still greater development may be expected locally and elsewhere as a result of the success attained.

There are three fish known locally as "tuna" in California, but only one species, the long-finned tuna or albacore (*Germo alalunga*), is used for canning purposes. The long-finned tuna occurs plentifully in the waters of southern California and can be taken with so little effort that it was formerly brought into port in considerable numbers, although no local market existed at the time. Experimental canning was begun about five years ago by a sardine-packing concern located in San Pedro. The first attempts to can this fish were unsatisfactory, and it soon became apparent that some radical departure from the ordinary fish-canning methods would be necessary. The essential feature of the method finally adopted is to bake the fish before it is put in the can and to introduce a vegetable oil to bring out the latent merits of the tuna. Other plants soon sprang up at San Pedro and San Diego, and the pack leaped from 250 cases the first year to 115,000 cases in 1913, in which year there were 9 plants in operation. The indications are that in 1914 the output may reach 400,000 cases.

The long-finned tuna is comparatively short and exceptionally thick bodied. Although single specimens weighing 100 pounds have been taken, the average weight is about 30 pounds. It makes its appearance in the waters of southern California early in the spring, and the fishery is often carried on as late as December. The fishermen report that these fish often disappear for months between June and November, and the theory has been advanced that they may spawn during this period. The long-fin is a high-sea fish, rarely taken near shore, and moves in large well-distributed schools at a depth of

about 10 feet. Often when the long-fin can be seen in plentiful quantities by the fishermen it is impossible to secure a catch owing to the presence in the schools of leaping and yellow-finned tunas. These gamey, swift-moving fish, owing to their prowess, are able to reach the bait before their less active associates.

Some fishermen entertain the belief that the best fishing grounds for the long-fin are at considerable distances from shore and that larger catches could be made with larger vessels on longer trips. The proper equipment has never been provided, however, and the fishermen have not yet tested this theory with their present craft. The boats employed are small, open motors driven by engines averaging about 8 horsepower. Usually three or four men constitute a crew, although some boats operate with only two.

Hand lines are used exclusively in securing the commercial catch, which until recently was taken by trolling. The Japanese are credited with introducing the method of "chumming" now in vogue and being employed with success. Before starting on a trip the fishermen prepare a quantity of bait for chumming by chopping up sardines and other small fish common in the local waters. When the fishermen are on the way to the fishing grounds they catch sardines for bait by seining alongside the boat; the sardines are placed in a tank on board, and the water is renewed frequently to keep the bait in good condition. To test the ground, a live sardine is placed on a trolling line and the boat proceeds slowly. When a strike is made, indicating the presence of a school, the engine is stopped and the chopped bait is thrown overboard to keep the school about the boat. The hand lines are then baited with live sardines; and if the fish are running well they can be taken almost as fast as the lines can be cast and hauled. It is reported that two men have taken a ton of tuna by this method in less than an hour. Daily trips to the fishing grounds are made, and the fleet returns each afternoon or evening to the canneries, the fish being dressed on the homeward trip when this is practicable.

When landed at the cannery the fish are placed in hanging racks to drain the blood from them and insure the whiteness of the meat. After draining they are placed in trays in a large low-pressure retort, where they are baked in live steam. As the fish usually arrive at the plant in the late afternoon or evening, the night is generally devoted to this stage of the process. Next morning the baked fish are transferred from the retorts to the filling tables. Before the meat is put into the cans it is carefully carved, the bones, skin, and dark meat being removed. The white meat, kept as nearly whole as possible, then passes to the filling crew. In addition to a pinch of salt, a small quantity of oil is placed in each can prior to filling, to supply the lack of natural oil in the fish. Olive oil was originally used for this purpose, but in 1913 all the plants except one discontinued this practice and substituted cottonseed oil, which, it is claimed, has given equal satisfaction. The solderless process is employed almost exclusively in tuna canning, so that from the filling tables the cans proceed to the topper, thence through the exhaust box to retorts similar to those employed in salmon canneries, where the fish are again cooked in steam under pressure. This product is now being marketed both as "tuna" and "tunny."

A few of the canning companies have experimented in the packing of long-finned tuna in other forms. Kipperd tuna is an exceptionally palatable product, and is said to find a ready local sale in the State.

UTILIZATION OF NEGLECTED AQUATIC RESOURCES.

For a number of years the Bureau has been conducting inquiries into the potential value and possibility of using certain aquatic products which are wholly neglected or but inadequately utilized in the United States. A notable case is the sea mussel, concerning which various reports had been issued; but aside from some little newspaper comment only slight public notice has been given to the recommendations and suggestions which have been made. In January, 1914, an advantageous opportunity was presented for introducing this cheap, abundant, and excellent mollusk in one of the prominent hotels of Boston, and by the judicious cultivation of newspaper publicity the experiment attracted so much attention that within a few months mussels were being served and given a conspicuous place on the menus of over 70 of the principal hotels, restaurants, and clubs of the city. After the public had become familiar with the new article of food, either by actual trial in the public dining rooms or through the numerous newspaper articles, both serious and humorous, arrangements were made to have them placed on sale by retail dealers and vendors, who were furnished with large placards giving the product the Bureau's indorsement. Simultaneously there was issued and generously distributed a circular explaining the nature of sea mussels, their excellence, abundance, and cheapness, and giving a number of tested recipes for cooking them. About the same time every police station in the city was supplied with mussels and circulars for the use of the officers in their homes, thus establishing foci of information concerning the new food in all parts of the city.

This practical campaign attracted wide attention and placed the mussel as a regular commodity in the markets of Boston and adjacent communities, to the benefit of consumer, dealer, and fisherman. The propaganda will be extended to other parts of the seaboard; and as the mussel is excellent as a canned product, prepared in a variety of ways, its consumption should be eventually extended to all parts of the country.

Preliminary experiments and inquiries have been made for a somewhat similar campaign to secure the utilization of the dogfish, but as this species is the victim of prejudice, and other impediments to its exploitation are recognized, it is probable that legislation giving the Bureau additional authority in the use of its appropriations and employees will be necessary. The dogfish, on account of its rapacity, is a scourge to the fisheries, and so long as it remains unutilized is not only itself wasted, but raises the price of recognized food fishes by interfering with their capture. The Bureau believes that it is impracticable to materially reduce the numbers of these destructive little sharks, but that if they can be brought into consumption as food there will accrue not only relief to the now harried fisherman but a double benefit to the consumer.

PROPAGATION AND DISTRIBUTION OF FOOD FISHES.

GENERAL EXTENT OF THE WORK.

The fish-cultural operations of the Bureau during the fiscal year 1914 were attended by a high degree of success, and the output exceeded that of any previous year. This was accomplished without increase in funds over those available in 1913. The work was for the most part conducted along established lines, with special attention to increased efficiency; and the noteworthy results attained have come chiefly through the development of present resources and the extension of the operations into territory contiguous to existing fields of activity.

The egg taking and hatching operations were conducted in 34 States and Alaska, and upward of 40 food and game fishes and the lobster were propagated. The output aggregated 4,047,643,417 fish and eggs. Of this number, 485,000,000 represented the migratory food fishes of the Atlantic coast streams, 1,020,000,000 the commercial fishes of the Great Lakes, 2,276,000,000 the food fishes of the north Atlantic coast, 223,000,000 the salmons of the Pacific seaboard, and the remainder the fishes of the minor interior waters. About 98 per cent of the output represents the commercial food fishes, and a very large percentage of these were hatched from eggs which, under natural conditions, would have been lost. The following table summarizes the distribution of fish and eggs for the year:

SUMMARY OF DISTRIBUTIONS, 1914.

| Species. | Eggs. | Fry. | Fingerlings, yearlings, and adults. | Total. |
|-----------------------------|-------------|---------------|---|---------------|
| Catfishes..... | | | 554,310 | 554,310 |
| Carp..... | | | 231,146 | 231,146 |
| Sucker..... | | | 1,200 | 1,200 |
| Buffalo fish..... | | 150,000 | 147,195 | 297,195 |
| Shad..... | | 61,827,660 | | 61,827,660 |
| Alewife..... | | 184,000 | | 184,000 |
| Whitfish..... | 126,580,000 | 327,435,000 | | 454,015,000 |
| Lake herring..... | | 900,000 | | 900,000 |
| Silver salmon..... | 95,840 | 24,619,456 | 27,258 | 27,742,554 |
| Chinook salmon..... | 26,451,545 | 48,886,607 | 5,582,796 | 80,920,948 |
| Blueback salmon..... | 6,020,000 | 53,071,574 | 120,000 | 59,211,574 |
| Humpback salmon..... | | 44,817,644 | 34,355 | 44,851,999 |
| Dog salmon..... | | 8,672,735 | | 8,672,735 |
| Steelhead trout..... | 579,000 | 4,022,438 | 313,620 | 4,915,058 |
| Rainbow trout..... | 1,091,950 | 181,800 | 1,656,229 | 2,930,009 |
| Atlantic salmon..... | | 2,573,295 | 16,993 | 2,590,288 |
| Landlocked salmon..... | 276,000 | 329,736 | 356,332 | 962,068 |
| Scotch sea trout..... | | | 20,396 | 20,396 |
| Blackspotted trout..... | 3,381,240 | 967,530 | 2,442,100 | 6,790,870 |
| Lock Leven trout..... | | | 46,500 | 46,500 |
| Lake trout..... | 11,283,000 | 33,114,171 | 2,719,473 | 47,116,644 |
| Brook trout..... | 2,065,000 | 4,128,290 | 5,891,033 | 12,074,323 |
| Smelt..... | 9,400,000 | 6,775,000 | 9,400 | 16,184,400 |
| Grayling..... | 150,000 | 343,000 | | 493,000 |
| Crayfish..... | | | 549,920 | 549,920 |
| Rock bass..... | | | 78,045 | 78,045 |
| Warmouth bass..... | | | 1,085 | 1,085 |
| Small-mouth black bass..... | | 91,000 | 96,745 | 187,745 |
| Large-mouth black bass..... | | | 822,650 | 822,650 |
| Sunfishes..... | | | 690,757 | 690,757 |
| Pike and pickerel..... | | | 5,675 | 5,675 |
| Pike perch..... | 331,660,000 | 185,914,000 | | 517,574,000 |
| Yellow perch..... | 9,500,000 | 179,924,389 | 12,775 | 189,437,164 |
| Striped bass..... | | 11,689,000 | | 11,689,000 |
| White perch..... | 1,400,000 | 218,600,000 | 2,000 | 220,002,000 |
| White bass..... | | | 4,450 | 4,450 |
| Mackerel..... | | 2,510,000 | | 2,510,000 |
| Cod..... | | 252,951,000 | | 252,951,000 |
| Pollock..... | | 561,408,422 | | 561,408,422 |
| Haddock..... | | 108,584,000 | | 108,584,000 |
| Flounder..... | | 1,171,321,000 | | 1,171,321,000 |
| Lobster..... | | 179,990,000 | 3,567 | 179,993,567 |
| Total..... | 530,213,575 | 3,494,991,837 | 22,438,005 | 4,047,643,417 |

Distributions of fishes suitable for stocking public waters or restocking depleted ones were made in practically every State in the Union and Alaska, while thousands of small streams, lakes, and ponds—the majority of them located on farms—were stocked with black basses, crappies, sunfishes, catfishes, and other desirable species. The distribution of this output necessitated 611,691 miles of railroad travel, 131,156 of which were performed by the Bureau's cars and the remainder (480,535 miles) by detached messengers. All transportation was paid for, with the exception of 96,463 miles.

While the artificial propagation of some valuable food fishes was on a smaller scale than usual, owing to the local climatic conditions prevailing during the spawning season and to other factors over which the Bureau had no control, large gains were made in other fields where natural conditions were more favorable. Among the species propagated in larger numbers than in the previous year were the chinook, silver, humpback, dog, and landlocked salmons, lake trout, pike perch, striped bass, sunfishes, smelt, cod, and flounder.

The popularity of the Bureau's work in stocking public and private waters, and the benefits accruing therefrom, are indicated by the widespread interest displayed by people living in all sections of the country. The applications for food and game fishes received during the year numbered more than 10,500, fully 75 per cent of them being for the black basses, crappies, sunfishes, and other pond fishes, for stocking natural interior waters of small area and artificially constructed ponds on farms.

Notwithstanding the annual growth and expansion of the Bureau's activities, its present facilities are heavily taxed in the attempt to fill the constantly growing demand from all sections of the country for fishes for public and private waters. Large as are the annual distributions, the output of none of the species exceeds the actual needs and in some instances falls short of the requirements. This is particularly true of the warm-water fishes adapted to cultivation in ponds. Owing to the impracticability of propagating such species by the artificial manipulation of the eggs, in accordance with the methods pursued in salmon and trout culture, the annual supplies are so limited that the Bureau has great difficulty with its present facilities in meeting the growing demands.

Notwithstanding the great development of fish hatching in the United States, the possibilities for effective work in various sections of the country remain practically unlimited; and with adequate financial support the Bureau can make vast unproductive areas in the South and West, in the Great Lakes and Rocky Mountain regions, on the Pacific coast, and in Alaska yield immense numbers of food and game fishes for stocking public waters.

HATCHERIES OPERATED.

Fish-cultural work in 1914 was carried on at 36 permanent hatcheries and 94 subhatcheries and egg-collecting stations, located in 34 States and Territories. Two new stations were added to the service by the partial completion of those at Louisville, Ky., and Orangeburg, S. C., where fish-cultural operations on a small scale were inaugurated late in the year.

Following is a list of the stations, with the subsidiary stations thereunder, the period of operation, and the species handled. The main stations, arranged alphabetically, are those for which a superintendent and permanent staff are provided by law. In some cases, however, the subsidiary or auxiliary stations are completely equipped, semi-independent, and quite as important as the head station to which, for administrative purposes, they are attached.

FISH-CULTURAL STATIONS OPERATED DURING THE FISCAL YEAR 1914.

| Designation. | Period of operation. | Species handled. |
|--|--------------------------------------|--|
| Afognak, Alaska..... | Entire year..... | Blueback, humpback, and silver salmon. |
| Eagle Lake, Alaska..... | May 30-Oct. 7..... | Blueback salmon. |
| Uganak Lake, Alaska..... | June 11-Oct. 26..... | Do. |
| Baird, Cal..... | Entire year..... | Chinook salmon. |
| Battle Creek, Cal..... | Sept. 1-Apr. 30..... | Do. |
| Hornbrook, Cal..... | Sept. 1-May 14..... | Chinook and silver salmon and rainbow trout. |
| Mill Creek, Cal..... | Sept. 1-Jan. 31..... | Chinook salmon. |
| Baker Lake, Wash..... | Entire year..... | Blueback, humpback, and silver salmon. |
| Birdsview, Wash..... | do..... | Chinook, dog, and humpback salmon. |
| Darrington, Wash..... | Aug. 20-May 3..... | Silver salmon and steelhead trout. |
| Day Creek, Wash..... | Aug. 12-May 27..... | Silver salmon. |
| Duckabush, Wash..... | Entire year..... | Chinook, dog, humpback, and silver salmon and steelhead trout. |
| Illabott Creek, Wash..... | July 1-Mar. 16..... | Do. |
| Quilcene, Wash..... | Entire year..... | Dog, humpback, and silver salmon and steelhead trout. |
| Sultan, Wash..... | do..... | Chinook, dog, humpback, and silver salmon and steelhead trout. |
| Battery, Md..... | May 19-May 29..... | Shad, herring, white perch, and yellow perch. |
| Boothbay Harbor, Me..... | Entire year..... | Cod, haddock, pollock, flatfish, and lobster. |
| Portland, Me..... | July-September..... | Lobster. |
| Bozeman, Mont..... | Entire year..... | Brook, black-spotted, rainbow, steelhead, and lake trout; grayling; and landlocked salmon. |
| O'Dell Creek, Mont..... | Apr. 7-May 15..... | Grayling. |
| South Meadow Creek, Mont..... | Mar. 9-May 6..... | Grayling and rainbow trout. |
| Yellowstone Park, Wyo..... | July 1-Aug. 27; May 30-June 30..... | Black-spotted trout. |
| Clear Creek, Wyo..... | July 1-July 23; June 15-June 30..... | Do. |
| Columbine Creek, Wyo..... | July 1-July 19; June 18-June 30..... | Do. |
| Cub Creek, Wyo..... | July 1-July 23; June 16-June 30..... | Do. |
| Lake Camp, Wyo..... | July 1-Aug. 27; May 30-June 30..... | Do. |
| Pelican Creek, Wyo..... | June 10-June 30..... | Do. |
| Thumb Camp, Wyo..... | June 1-June 21..... | Do. |
| Bryans Point, Md..... | Feb. 12-May 28..... | Shad and yellow perch. |
| Cape Vincent, N. Y..... | Entire year..... | Whitefish; lake herring; lake, brook, and rainbow trout; landlocked salmon; pike perch; and small-mouth black bass. |
| Three Mile Bay, N. Y..... | Nov. 15-Nov. 30..... | Lake herring. |
| Central Station, Washington, D. C..... | Entire year..... | Large and small mouth black bass; warmouth and rock bass; crappie; catfish; sunfish; pike perch; shad; whitefish; white and yellow perch; smelt; brook and rainbow trout; and humpback salmon. |
| Clackamas, Oreg..... | do..... | Chinook and silver salmon; and black-spotted, steelhead, brook, and rainbow trout. |
| Applegate Creek, Oreg..... | Sept. 10-May 31..... | Silver salmon and steelhead trout. |
| Big White Salmon, Oreg..... | Aug. 1-Feb. 29..... | Chinook salmon. |
| Eagle and Tanner Creeks, Bonneville, Oreg..... | Sept. 1-Oct. 31..... | Do. |
| Eagle Creek, Barton, Oreg..... | Apr. 1-June 20..... | Steelhead trout. |
| Illinois River, Oreg..... | Sept. 1-Jan. 1..... | Chinook and silver salmon. |
| Little White Salmon, Wash..... | Entire year..... | Chinook salmon. |
| Lower Rogue River, Oreg..... | Aug. 15-Mar. 31..... | Do. |
| Rogue River, Oreg..... | Entire year..... | Chinook and silver salmon and steelhead and black-spotted trout. |
| Upper Clackamas, Oreg..... | do..... | Chinook and silver salmon and steelhead trout. |
| Willamette Falls, Oreg..... | June 15-June 30..... | Shad. |
| Cold Springs, Ga..... | Entire year..... | Large-mouth black bass, catfish, and sunfish. |
| Harris Pond, Ga..... | do..... | Catfish and sunfish. |

FISH-CULTURAL STATIONS OPERATED DURING THE FISCAL YEAR 1914—Continued.

| Designation. | Period of operation. | Species handled. |
|------------------------------|---------------------------------------|---|
| Craig Brook, Me..... | Entire year..... | Atlantic, landlocked, and humpback salmon; brook, rainbow, and Scotch Sea trout; and hybrids. |
| Upper Penobscot, Me..... | Jan. 1-June 1..... | Atlantic salmon. |
| Duluth, Minn..... | Entire year..... | Lake trout; whitefish, pike perch; brook, rainbow, and steelhead trout, and landlocked salmon. |
| Grand Marais, Minn..... | Oct. 10-Dec. 2..... | Lake trout. |
| Isle Royale, Mich..... | Sept. 21-Nov. 12..... | Lake trout and whitefish. |
| Keweenaw Point, Mich..... | Oct. 5-Nov. 2..... | Lake trout. |
| Marquette, Mich..... | Oct. 13-Nov. 12..... | Do. |
| Munising, Mich..... | do..... | Do. |
| Ontonagon, Mich..... | Oct. 22-Nov. 13..... | Do. |
| Edenton, N. C..... | Entire year..... | Shad, bream, and black bass. |
| Weldon, N. C..... | Apr. 1-May 30..... | Striped bass. |
| Erwin, Tenn..... | Entire year..... | Rainbow and brook trout, large and small mouth black bass, rock bass, sunfish, yellow suckers, and carp. |
| Gloucester, Mass..... | do..... | Pollock, cod, flatfish, haddock, and lobster. |
| Boston, Mass..... | Nov. 1-Dec. 13..... | Lobster. |
| Rockport, Mass..... | May 1-July 15..... | Do. |
| Green Lake, Me..... | Entire year..... | Landlocked and humpback salmon, brook and lake trout, and smelt. |
| Grand Lake Stream, Me..... | do..... | Landlocked salmon. |
| Homer, Minn..... | do..... | Large and small mouth black bass, pike and yellow perch, rock bass, crappie, sunfish, buffalo fish, catfish, and carp. |
| La Crosse, Wis..... | Aug. 21-Oct. 24..... | Buffalo fish, catfish, yellow perch, large and small mouth black bass, crappie, sunfish, and rock bass. |
| Leadville, Colo..... | Entire year..... | Rainbow, brook, and black spotted trout. |
| Antero Reservoir, Colo..... | May 7-May 18..... | Rainbow trout. |
| Cheesman Lake, Colo..... | Apr. 7-May 15..... | Do. |
| Edith Lake, Colo..... | Oct. 15-Nov. 15..... | Brook trout. |
| Eldora Lake, Colo..... | do..... | Do. |
| Engelbrechts Lake, Colo..... | Oct. 9-Nov. 14..... | Do. |
| Musgrove Lakes, Colo..... | Oct. 16-Dec. 1..... | Do. |
| Seven Lakes, Colo..... | July 1-July 11; June 9-June 30..... | Black-spotted and rainbow trout. |
| Smiths Ponds, Colo..... | Oct. 25-Nov. 28..... | Brook trout. |
| Scotts Ponds, Colo..... | Oct. 5-Oct. 21..... | Do. |
| Turquoise Lake, Colo..... | Oct. 14-Nov. 22..... | Do. |
| Una Lake, Colo..... | Oct. 27-Nov. 12..... | Do. |
| Wellington Lake, Colo..... | Oct. 16-Nov. 25..... | Do. |
| Louisville, Ky..... | April-June..... | Large-mouth black bass. |
| Mammoth Spring, Ark..... | Entire year..... | Large and small mouth black bass, crappie, sunfish, catfish, and carp. |
| Frars Point, Miss..... | July and August..... | Black bass, catfish, and sunfish. |
| Manchester, Iowa..... | Entire year..... | Brook, rainbow, and lake trout; large and small mouth black bass; rock bass; crappie; bream; pike perch; pike; yellow perch, white bass; buffalo fish, catfish, and carp. |
| Bellevue, Iowa..... | July 1-Nov. 15..... | Large-mouth black bass, crappie, bream, catfish, white bass, carp, yellow perch and buffalo fish. |
| North McGregor, Iowa..... | July 1-Oct. 4..... | Large-mouth black bass, yellow perch, crappie, catfish, pike, carp, and buffalo fish. |
| Nashua, N. H..... | Entire year..... | Brook and rainbow trout, landlocked salmon, and small-mouth black bass. |
| Neosho, Mo..... | do..... | Rainbow trout, black bass, small-mouth black bass, crappie, strawberry bass, sunfish, carp, catfish, yellow perch, and pike perch. |
| Northville, Mich..... | do..... | Lake, brook, and rainbow trout; grayling; small-mouth black bass; and sunfish. |
| Au Gres, Mich..... | Nov. 16-Nov. 30..... | Whitefish. |
| Au Sable, Mich..... | Nov. 10-Nov. 25..... | Lake trout. |
| Bay City, Mich..... | Apr. 11-Apr. 28..... | Pike perch. |
| Belle Isle, Mich..... | Oct. 24-Dec. 16..... | Whitefish. |
| Charity Island, Mich..... | Oct. 6-Nov. 15..... | Do. |
| Charlevoix, Mich..... | Oct. 27-Nov. 30; Feb. 24-Apr. 25..... | Lake trout. |
| Detour, Mich..... | Oct. 20-Nov. 14..... | Do. |
| Detroit, Mich..... | Entire year..... | Whitefish and pike perch. |
| Fairport, Mich..... | Oct. 30-Nov. 21..... | Lake trout. |
| Frankfort, Mich..... | Nov. 3-Nov. 25..... | Do. |
| Grassy Island, Mich..... | Oct. 13-Dec. 3..... | Whitefish. |

FISH-CULTURAL STATIONS OPERATED DURING THE FISCAL YEAR 1914—Continued.

| Designation. | Period of operation. | Species handled. |
|--------------------------------|-----------------------------------|---|
| Northville, Mich.—Continued. | | |
| Manistique, Mich..... | Oct. 30–Nov. 23; Nov. 28–Dec. 9. | Lake trout and whitefish. |
| Naubinway, Mich..... | Nov. 23–Nov. 27..... | Whitefish. |
| St. James, Mich..... | Oct. 29–Dec. 16..... | Lake trout and whitefish. |
| St. Joseph, Mich..... | Oct. 30–Nov. 23..... | Lake trout. |
| Sault Ste. Marie, Mich..... | Feb. 15–May 15..... | Lake trout and whitefish. |
| Orangeburg, S. C..... | Apr.–June..... | Large-mouth black bass. |
| Put-in Bay, Ohio..... | Entire year..... | Whitefish, lake trout, and pike perch. |
| Kellys Island, Ohio..... | Nov. 11–Dec. 8..... | Whitefish. |
| Middle Bass, Ohio..... | Nov. 12–Nov. 30; Apr. 12–Apr. 30. | Whitefish and pike perch. |
| Monroe, Mich..... | Oct. 30–Dec. 1..... | Whitefish. |
| North Bass, Ohio..... | Nov. 6–Dec. 6; Apr. 12–Apr. 28.. | Pike perch. |
| Port Clinton, Ohio..... | Nov. 3–Dec. 4; Apr. 3–May 2.... | Whitefish and pike perch. |
| Toledo, Ohio..... | Nov. 6–Dec. 4; Apr. 1–May 7.... | Do. |
| Quincy, Ill..... | Entire year..... | Office headquarters. |
| Meredosia, Ill..... |do..... | Large and small mouth black bass, catfish, yellow perch, rock bass, pike perch, buffalo fish, yellow bass, white bass, sunfish, crappie, etc. |
| St. Johnsbury, Vt..... |do..... | Brook, lake, and steelhead trout; landlocked salmon; small-mouth black bass, and catfish. |
| Averill Lakes, Vt..... | Sept. 16–Jan. 9..... | Landlocked salmon. |
| Darling Pond, Vt..... | July 28–Nov. 28..... | Brook trout. |
| Holden, Vt..... | Entire year..... | Brook, lake, and steelhead trout, and landlocked salmon. |
| Lake Mitchell, Vt..... | Oct. 1–Dec. 19..... | Brook trout. |
| Swanton, Vt..... | Mar. 25–June 4..... | Pike perch and yellow perch. |
| San Marcos, Tex..... | Entire year..... | Large-mouth black bass, crappie, strawberry bass, warmouth bass, sunfish, and rock bass. |
| Spearfish, S. Dak..... |do..... | Brook, rainbow, Loch Leven, black-spotted, and steelhead trout. |
| Schmidt Lakes, S. Dak..... | Oct. 20–Dec. 20..... | Brook trout. |
| Sand Creek, S. Dak..... | Oct. 20–Jan. 15..... | Do. |
| Tupelo, Miss..... | Entire year..... | Large-mouth black bass, bream, crappie, rock bass, warmouth bass, catfish, and yellow perch. |
| White Sulphur Springs, W. Va.. |do..... | Brook and rainbow trout, and small and large mouth black bass. |
| Woods Hole, Mass..... |do..... | Cod, flatfish, and mackerel. |
| Noank, Conn..... | Mar. 20–Apr. 4..... | Flatfish. |
| Waquoit, Mass..... | Jan. 26–Apr. 8..... | Do. |
| Wickford, R. I..... | Mar. 9–Apr. 15..... | Do. |
| Wytheville, Va..... | Entire year..... | Rainbow and brook trout, large and small mouth black bass, rock bass, bream, and pike perch. |
| Yes Bay, Alaska..... |do..... | Blueback salmon. |
| Ketchikan Creek, Alaska.... | September..... | Humpback salmon. |

COOPERATION WITH THE STATES.

In continuation of its cooperative relations with the States in fish-cultural work, the Bureau furnished during the year large allotments of eggs, and limited numbers of fry, fingerling, and yearling fish to stock State hatcheries. The extent to which the various States were recipients of the distribution of food and game fishes and of fish eggs during the year 1914 is shown in the table following.

ALLOTMENTS OF FISH AND EGGS TO STATE FISH COMMISSIONS FOR THE FISCAL YEAR 1914.

| State and species. | Eggs. | Fry. | Fingerlings, yearlings, and adults. |
|---------------------------------------|-------------|-----------|---|
| California: | | | |
| Brook trout..... | 100,000 | | |
| Chinook salmon..... | 25,323,645 | | |
| Silver salmon..... | 95,840 | | |
| Colorado: Black-spotted trout. | 600,000 | | |
| Idaho: | | | |
| Black-spotted trout..... | 205,000 | | |
| Rainbow trout..... | 150,000 | | |
| Indiana: Pike perch. | 7,500,000 | | |
| Illinois: Pike perch. | 7,500,000 | | |
| Maine: | | | |
| Brook trout..... | 100,000 | | |
| Lake trout..... | 50,000 | | |
| Landlocked salmon..... | 100,000 | | |
| Maryland: Rainbow trout. | 30,000 | | |
| Massachusetts: | | | |
| Black bass..... | | | 400 |
| Chinook salmon..... | 50,000 | | |
| Pike perch..... | 20,225,000 | | |
| Yellow perch..... | 8,000,000 | | |
| Michigan: | | | |
| Grayling..... | 50,000 | | |
| Lake trout..... | 3,008,000 | | |
| Landlocked salmon..... | 25,000 | | |
| Pike perch..... | 15,000,000 | | |
| Smelt..... | 5,000,000 | | |
| Minnesota: | | | |
| Lake trout..... | | | |
| Landlocked salmon..... | 15,000 | | |
| Steelhead trout..... | 50,000 | | |
| Missouri: | | | |
| Brook trout..... | 50,000 | | |
| Rainbow trout..... | 50,000 | | |
| Pike perch..... | 10,000,000 | | |
| Montana: | | | |
| Black bass..... | | | 66 |
| Black-spotted trout..... | 636,240 | | |
| Brook trout..... | 200,000 | | |
| Lake trout..... | | | 18,900 |
| Whitefish..... | 2,000,000 | | |
| Nebraska: | | | |
| Pike perch..... | 2,000,000 | | |
| Rainbow trout..... | 100,000 | | |
| Nevada: | | | |
| Brook trout..... | 50,000 | | |
| Rainbow trout..... | 98,000 | | |
| New Hampshire: | | | |
| Brook trout..... | 75,000 | | |
| Landlocked salmon..... | 30,000 | | |
| Rainbow trout..... | 50,000 | | |
| Steelhead trout..... | 50,000 | | |
| White perch..... | 1,000,000 | | |
| New Jersey: | | | |
| Crappie..... | | | 210 |
| Landlocked salmon..... | 10,000 | | |
| Pike perch..... | | 2,500,000 | |
| Sunfish..... | | | 500 |
| Yellow perch..... | | 6,500,000 | |
| New York: | | | |
| Lake trout..... | 100,000 | | |
| Steelhead trout..... | 50,000 | | |
| North Dakota: | | | |
| Pike perch..... | 5,000,000 | | |
| Rainbow trout..... | 100,000 | | |
| Steelhead trout..... | 100,000 | | |
| Ohio: | | | |
| Pike perch..... | 261,625,000 | | |
| Whitefish..... | 83,320,000 | | |
| Oregon: | | | |
| Black-spotted trout..... | 200,000 | | |
| Blueback salmon..... | 2,000,000 | | |
| Brook trout..... | 250,000 | | |
| Chinook salmon..... | 1,000,000 | | |
| Rainbow trout..... | 200,000 | | |
| Pennsylvania: | | | |
| Lake trout..... | 100,000 | | |
| Whitefish..... | 36,000,000 | | |

ALLOTMENTS OF FISH AND EGGS TO STATE FISH COMMISSIONS FOR THE FISCAL YEAR 1914—Continued.

| State and species. | Eggs. | Fry. | Fingerlings, yearlings, and adults. |
|--------------------------|-------------|-----------|-------------------------------------|
| Utah: | | | |
| Brook trout..... | 175,000 | | |
| Lake trout..... | 50,000 | | |
| Steelhead trout..... | 50,000 | | |
| Vermont: | | | |
| Brook trout..... | | | 7,600 |
| Lake trout..... | 50,000 | | |
| Landlocked salmon..... | 20,000 | | |
| Spotted catfish..... | | | 138 |
| Steelhead trout..... | 50,000 | | |
| Washington: | | | |
| Blueback salmon..... | 50,000 | | |
| Brook trout..... | 100,000 | | |
| Steelhead trout..... | 20,000 | | |
| Wisconsin: | | | |
| Lake trout..... | 7,500,000 | | |
| Whitefish..... | 5,000,000 | | |
| Wyoming: | | | |
| Black-spotted trout..... | 800,000 | | |
| Brook trout..... | 250,000 | | |
| Rainbow trout..... | 192,000 | | |
| Steelhead trout..... | 50,000 | | |
| Total..... | 514,237,725 | 9,000,000 | 27,814 |

In order to minimize the possibility of injury resulting from the introduction of nonindigenous fishes into State waters, the Bureau has adhered to its policy of deferring to the judgment of the proper State officials regarding all applications for fish not native to a given State, and has definitely decided to discontinue the planting of predaceous fishes, such as the black basses, crappies, sunfishes, perch, pikes, and allied species, in any of the lakes or streams of the Pacific coast which are inhabited by salmon or trout or connected with trout and salmon waters. This policy, which commends itself to all who have the welfare of the fisheries at heart, has received the formal approval of fishery authorities and the congressional delegations of those States. Acting in pursuance thereof, the Bureau will henceforth refuse to entertain applications for any of the fishes mentioned for stocking waters in the Pacific Coast States.

PROPAGATION OF THE PACIFIC SALMONS.

The most extensive fish-cultural work done by the Bureau is addressed to the Pacific salmon. In 1914 hatching operations were conducted at 14 points and egg-collecting at 14 other points. The general results attained were gratifying, and the output materially exceeded that of 1913.

With the exception of the Quinault region, Washington, where investigations are in progress looking toward the inauguration of fish-cultural work in that field, most of the more important salmon streams in Washington and Oregon are covered by the Bureau's operations, and with increased facilities for handling the eggs and young, the installation of permanent traps and barriers to intercept the run of fish, and the improvement of the water supply, which are now being provided for at many of the stations, the output another year should be materially increased.

A condition which curtailed the run of salmon in streams on Afognak Island, Alaska, in 1912-13 was again in evidence in the season of 1913-14; that is, the volcanic ash covering the island as a result of the eruption of Mount Katmai on June 6, 1912, proved a material obstacle to fish-cultural operations. The ash was washed from the mountain sides into the rivers and creeks with every rain, forming effectual barriers at the mouths of some of the streams against the entrance of salmon from the sea. The spawning of the red salmon commenced late in July and continued to the middle of October, but the run of fish in Litnik Lake and tributaries was small, and comparatively few ripe fish were secured. The fry resulting from this work numbered 7,761,700.

It had been planned to collect redfish eggs at Malena Lake, but an investigation developed the fact that the mouth of the creek forming the outlet of the lake was so filled with ash that the fish could not enter. Commercial fishermen from Malena reported that salmon ascended the river from the straits, but being unable to reach their spawning grounds returned to the ocean. The appearance of an unusually large run of humpback salmon in the vicinity of the station in October and November permitted the collection of 13,900,000 eggs and, incidentally, a few silver-salmon eggs. The output of fry of all species for the year numbered 19,846,104, an appreciable increase over that of the previous year.

Investigations at Eagle Harbor and Uganik Lake, on Kodiak Island, in the spring and summer of 1913, developed the fact that there is not a sufficient run of salmon at either of these points to warrant the establishment of a field collecting station, taking into consideration their inaccessible location and great distance from Afognak. It is now being planned to conduct investigations at several points nearer the main station, in the belief that more productive and less expensive fields can be found.

In the vicinity of the Yes Bay, Alaska, hatchery the run of red salmon in the summer and fall of 1913 was smaller than usual, and the output of fry was correspondingly reduced. Continuous rains throughout the spawning season caused unusually high water in the streams tributary to Yes Bay, making it exceedingly difficult to capture spawning fish in the deep, swift waters on the spawning beds; but by close and persistent application 49,050,000 eggs were secured, and 94 per cent of these were hatched. Of the resulting fry, 18,656,000 were distributed after the absorption of the yolk sac, and the remainder were held and fed until they had reached a length of 1½ to 2 inches. Humpback-salmon eggs to the number of 5,280,000 were collected near Ketchikan during the fall and transferred to the Yes Bay station for development. Important improvements effected at this station during the year included the installation of an electric lighting plant and the construction of three salmon-rearing ponds, each 12 by 60 feet.

The year's operations at the Washington stations were very successful, the output of all species numbering 48,892,246 fish and eggs. The collection of blueback-salmon eggs was considerably curtailed by the escape early in the season of a large number of brood fish which were being held in Baker River to ripen, and the outcome of the work with dog salmon and steelhead trout was not as great as had been anticipated. These shortages, added to the loss of young

salmon at the time of the destruction of the Baker Lake hatchery by fire, materially reduced the output, but the substantial gains in the propagation of the chinook, humpback, and silver salmon gave an aggregate output nearly 10,000,000 in excess of that of the previous year.

Violent rains, followed by heavy floods, in streams contiguous to the Quilcene and Duckabush stations, on Hoods Canal, wrecked the racks and traps and completely destroyed a barrier that had been constructed in the Duckabush River; but notwithstanding these adverse conditions the work of the stations resulted satisfactorily. The run of humpback salmon in Hoods Canal during the fall of 1913 was enormous. Schools of salmon many acres in extent were observed near the mouths of the various streams as they slowly made their way up the canal. A very large number of these fish made their appearance below the racks at the Duckabush station before preparations had been completed for the collection of eggs, and the major part of them passed on up the river.

There was a slight falling off in the collection of chinook-salmon eggs in some fields in the State of Oregon, but this was more than compensated for by the gains in other parts of the State. The conditions affecting the run of chinook salmon in the Columbia River were similar to those existing in 1913. An enormous run of fish—said to be one of the largest known—appeared in the river early in September, increasing rapidly as the season advanced. At the stations on the Big White Salmon and Little White Salmon Rivers the 44,229,000 eggs taken far exceeded the capacity of the hatcheries, making it necessary to transfer large consignments of eggs to other stations for development. The destruction of the racks on the Clackamas and Lower Rogue Rivers and the failure of the usual run of fish into the Illinois River curtailed the output of chinook salmon in those fields. The distribution of silver salmon from the Oregon stations was nearly three times that of the previous year, while there was an average yield of steelhead trout.

The work accomplished at the California stations was satisfactory. The output of chinook-salmon fry and fingerlings was nearly double that of last year and of silver salmon fully ten times as great. The majority of the eggs taken on the McCloud River were secured from the fall run of fish, the spring run being very light. At the Battle Creek and Mill Creek auxiliaries, where only the fall run is available, 33,060,310 chinook-salmon eggs were collected. Silver-salmon eggs to the number of 3,129,000 were collected in the Klamath River. An attempt to secure eggs from the commercial fishermen on the Sacramento River resulted in failure, because of the irregularity of their operations and the poor success attained in transferring the green eggs in wagon over the rough mountain roads to the hatcheries for development. Another year an attempt will be made to capture brood salmon at the point where Mill Creek enters the Sacramento River and hold them between racks in the creek for the ripening of their eggs. There was only one run of chinook salmon in the Klamath River in the vicinity of the field station at Hornbrook, and as fully 50 per cent of the fish composing it were undersized the collections of eggs were inconsiderable.

The superintendent of the California stations reports that the State authorities have taken steps to protect the young salmon liberated

in the Sacramento River by the rigid enforcement of the law compelling the screening of intakes to irrigating ditches and the easements and overflows of the river, thus preventing the passage of young salmon and their destruction on the lowlands. He also reports that the State Fish Commission has greatly increased its facilities for rearing salmon fry, and has improved its methods of distribution. Under the changed conditions there seems to be no necessity for changing the location of the Bureau's stations in California, or departing from the cooperative policy of turning over to the State hatcheries for development the surplus salmon eggs taken at the Baird and auxiliary stations.

The Bureau is providing facilities which will enable it to rear each year a larger percentage of salmon to the fingerling size, in the expectation that eventually most of the output may be liberated as fingerlings or, in some cases, yearlings. This procedure entails a large increase in expense, and the funds available do not permit the immediate establishment of all the rearing ponds and other facilities necessary to accommodate the entire product. A very important item of expense is food, and a cheap and efficient salmon food is one of the great desiderata. Various experiments have been undertaken with a view of decreasing the cost of feeding, and it is possible that the solution of the problem will be found in the utilization of the parent fish, which have heretofore been mostly wasted. By salting, drying, or freezing the bodies of the spent fish, a large quantity of food will be made available during the entire period when it is desirable to retain the young salmon.

In 1914 the cost of rearing salmon to the fingerling stage varied from 24.8 cents to 86 cents per thousand, according to the particular station and the average size of the fish at the time of planting. The lowest cost secured was that of rearing chinook salmon at the California stations.

The creation during the year of a Pacific district embracing all the Bureau's salmon stations in California, Oregon, Washington, and Alaska and the placing of their operations under the general direction of a field superintendent have been productive of good results. Many minor routine matters pertaining to the Pacific salmon work heretofore attended to in the Washington office are now acted upon by the field superintendent. Various improvements and much economy have been effected by the periodical inspection of the stations, and the central office is in a better position than heretofore to act intelligently upon matters relating to the salmon work.

FISH PROPAGATION ON THE GREAT LAKES.

The fish-cultural work on the Great Lakes is conducted at four main stations and numerous auxiliaries, and is addressed to three great commercial fishes—the lake trout, the whitefish, and the pike perch. Incidentally, the cisco or lake herring and other local food fishes are handled as circumstances permit.

The collecting of lake-trout eggs for stocking the Michigan and Minnesota hatcheries of the Bureau was subjected to the provisions of the new law enacted by the Michigan Legislature in 1912, which became operative for the first time in the fall of 1913. Under the old law the prohibitive season for fishing in the Michigan waters of the

Great Lakes began November 1, corresponding closely with the opening of the lake-trout spawning season, while the new law prescribed a close season from October 10 to November 1. Some good effects of the provision of law relative to the saving of trout spawn by the commercial fishermen permitted to fish during the close period were clearly apparent in Lake Superior fields, where about half the eggs collected were secured before November 1. The benefits of the law were hardly discernible, however, in the work on Lakes Michigan and Huron, as all but 3,840,000 of the eggs taken in these waters were obtained during the time when fishing operations were not restricted.

On Lake Superior the collecting of lake-trout eggs extended from September 21 to December 3, and 18,590,000 eggs of good quality were obtained and transferred to the Duluth hatchery. The stock of this hatchery was later supplemented by the transfer of 3,684,000 eggs from one of the fields in Lake Michigan. The season's work with the lake trout at Duluth resulted in an output of 1,050,000 eyed eggs, which were shipped on assignment to various State fish commissions and stations of the Bureau, and 16,225,000 fry and fingerling fish. Owing to the late spring the hatching period was delayed somewhat beyond the usual time, but both fry and fingerling fish were of uniformly fine quality, and the distributions, which extended from March 23 to June 14, were accomplished without mishap. While favorable weather on Lake Superior during the egg-collecting period is partly responsible for the success of the work, it may also be attributed in no small measure to the enforcement of the recently enacted fishery legislation.

Incidental to the lake-trout work, 2,205,000 very fine whitefish eggs were collected in one of the Lake Superior fields and hatched at the Duluth station in connection with a consignment of 25,000,000 of the same species shipped from Put-in Bay, Ohio. The latter consignment appeared to be of poor quality when received, but the unusually favorable water temperatures to which it was subjected during incubation made possible a yield from the combined stock of 15,750,000 healthy, vigorous fry, which were liberated late in April at suitable points in Lake Superior. Additional work accomplished at this station with the commercial fishes consisted in the hatching of 20,000,000 pike-perch eggs derived from the Detroit hatchery, and the distribution of the fry to applicants in Minnesota and Wisconsin.

The weather conditions in the lake-trout fields operated from the Michigan stations were favorable for the collection of eggs, with the exception of a severe storm on November 9, at the height of the spawning season, which caused a practical suspension of the work for nearly a week and materially reduced the season's collections. Six field stations for the collection and care of eggs received from the commercial fishermen were opened on Lake Michigan and two on Lake Huron, the more important ones being placed under the supervision of regular employees of the Bureau, while trained temporary men were hired to take charge of the minor stations. With the view of insuring a good quality of eggs, experienced spawn takers were also placed on the large steam tugs operating in the most productive fields, in order to instruct the fishermen in taking the eggs. Fishermen operating gasoline boats took the spawn without such assistance. Of the 52,910,380 eggs resulting from the season's collections, 19,192,000 were used to fill applications from State fish commissions

and for stocking the Great Lakes hatcheries of the Bureau in other States. The remaining stock sufficed to fill the Sault Ste. Marie and Charlevoix hatcheries, and the fry hatched therefrom were returned to the spawning grounds in the immediate vicinity.

While the lake-trout work was in progress arrangements were made for the penning of brood whitefish near the important fisheries in the Detroit River and at Charity Island, in Saginaw Bay. At the latter point 5,393 fish had been collected and were being held in pens to ripen when the great storm of November 9 swept down on the station, carrying away most of the crates and with them 4,329 fish, valued at \$1,500. Some of the damaged crates were recovered later, but the few fish remaining in them were dead. As the storm had totally destroyed the pound nets in the bay, thus putting a stop to the operations of the fishermen, the Bureau's work came to an abrupt end, with very inconsiderable results to compensate for the time and money expended. In the Detroit River, where the effects of the storm were not so severe, 103,280,000 eggs of medium quality were secured. In an effort to partially make up for the shortage of eggs caused by the failure of the work at Charity Island, three collecting stations were opened in December in the vicinity of relatively small fisheries in upper Lake Michigan, and here approximately 25,000,000 eggs were obtained. The stock was further supplemented by transfer from the Lake Erie fields of 41,400,000 green eggs, for the purpose of relieving the congested condition of the Put-in Bay hatchery. The eggs were placed in the Detroit and Sault Ste. Marie hatcheries, and in the process of eyeing very heavy losses resulted. Eyed eggs to the number of 5,600,000 were utilized in filling applications, and 101,100,000 fry were returned to the waters of the Great Lakes.

The whitefish fisheries of the Detroit River have been undergoing a steady decline for years, resulting in corresponding decreases in egg collections at Grassy Island and Belle Isle in that river. A deep ship canal is now in course of construction which will cut through a portion of Grassy Island, completely destroying the fishing grounds now operated by the Bureau in that river. The majority of the whitefish eggs now taken in Michigan waters are derived from the field station on Charity Island, in Saginaw Bay, established in 1910, and from several points in upper Lake Michigan. All the eggs thus taken are first shipped to the Detroit hatchery, and after reaching the eyed stage part of them are transferred and hatched at the auxiliary stations in northern Michigan, the resulting fry being deposited on the spawning grounds in the vicinity. This method, entailing the expense of double transportation of eggs for partial development and in order to facilitate the distribution of the fry on the spawning grounds, is hardly justifiable, and should be abandoned as soon as practicable.

The Bureau is now paying an annual rental of \$425 for the use of the land on which the Detroit hatchery is located. In view of the heavy expense involved in the use of the Detroit station, which belongs to the State but has not been operated by the State for many years, it does not appear advisable, in view of the existing condition of the fisheries in the Detroit River, to continue the hatching operations at Detroit. It is therefore proposed to take steps to locate a desirable site for an auxiliary hatching station in the Saginaw Bay district,

and when a suitable location is found it is hoped that Congress will provide an adequate appropriation for the acquirement of the land and the construction of the station.

The spawning season of the pike perch in Michigan waters was between April 11 and 28. The total collections of eggs from fish turned over to the Bureau by the commercial fishermen operating in Saginaw Bay and at the mouth of the Pine River amounted to 167,850,000, of which 35,000,000 were shipped green to outside Federal and State hatcheries. Fifteen million eyed eggs were turned over to the Michigan State Fish Commission, to fulfill the terms of the lease of the Detroit hatchery, and 25,530,000 fry were hatched from the remainder and liberated on the spawning grounds.

When the windstorm which created such havoc in the upper lakes struck the west end of Lake Erie, whitefish had assembled on the spawning grounds in considerable numbers, but as the weather prior to that time had been too warm for the holding of fish in crates, no penning operations had been undertaken at the various field stations operated in connection with the Put-in Bay, Ohio, station. The wind blew so violently for three days that the water was driven from the west end of the lake to such an extent that it fell from 4 feet to 5 feet below the normal level. Fishing apparatus of all kinds was greatly damaged, and the waters became so roily that the fish deserted the spawning grounds, and in some places returned only in comparatively small numbers. The fisheries in the vicinity of Port Clinton and along the south shore of the reefs sustained the greatest damage. Along the west shore the nets were more or less protected, and the current from the Detroit River soon cleared the water in the vicinity of the fisheries at Monroe Piers, producing ideal spawning conditions. Here the fish congregated in immense numbers, permitting of a catch far in excess of any previous year's record. At the Bureau's field station at this point 15,694 impounded fish yielded 122,160,000 eggs. These, added to the eggs purchased direct from the fishermen, brought the season's collections in the Monroe Piers field to 306,360,000, and had there been facilities for handling them many more might have been secured. The aggregate collections from all of the Lake Erie fields amounted to 488,240,000, far more than could be handled in the Put-in Bay hatchery with the existing facilities. Shipments of green eggs to the number of 233,760,000 were forwarded direct from the fields of collection to various Federal and State hatcheries, and similar disposition was made of 12,160,000 after the eye-spots appeared. The remainder were developed at the Put-in Bay station, producing 163,200,000 healthy, vigorous fry, all of which were returned to the spawning grounds in the lake.

The Ohio State Fish Commission having arranged to cover all available territory in a search for lake-herring eggs, the Bureau made no attempt to take up that work. Moreover, in view of the enormous collections of whitefish eggs, there would have been no room for lake-herring eggs had any been secured.

Only fair results were attained in the pike-perch work on Lake Erie. No severe storms occurred in the course of the spawning season, which extended from April 7 to May 7, but a succession of gales in several of the fields prevented the installation of the fishermen's nets until the season was well advanced. Especially was this true at Port Clinton, ordinarily one of the most prolific sections.

The more favorable weather conditions prevailing in other portions of the lake resulted in large catches of fish, but a large percentage of them were unripe. The work at Port Clinton was not hampered by this difficulty, and the collections there were more than twice as large as in all the other fields combined. The aggregate take from all sources was 592,000,000. The output included 296,625,000 green eggs, 47,100,000 eyed eggs, and 69,600,000 fry, about half of which were utilized in filling applications from neighboring States. The remainder were returned to the spawning grounds in Lake Erie.

The hatchery at Cape Vincent, N. Y., was, as usual, supplied with eggs of the commercial fishes shipped from other Great Lakes stations. The output resulting from such shipments comprised 27,000,000 whitefish, 3,572,000 lake trout, and 9,700,000 pike-perch fry, which were liberated in Lake Ontario waters. Attempts made during the season to secure eggs from the various commercial fisheries on Lake Ontario resulted in failure so far as whitefish and lake herring were concerned, but 128,000 lake-trout eggs of fair quality were collected and hatched. The small substation recently established for the collection of pike-perch eggs could not be operated owing to lack of funds.

The Cape Vincent station, owing to its unsuitable location with reference to the sources of egg supply, has practically been a failure. Since its establishment in 1896 the station has simply served as a receiving depot for the development of eggs shipped from other stations. Under instructions from the Secretary, investigations are being made to ascertain if a desirable site can be secured on the shores of Lake Ontario where successful operations can be conducted with the commercial fishes of that region and in connection with which the propagation of pond species also can be undertaken. This will necessitate the acquirement of from 15 to 20 acres of land supplied with a gravity flow of water. In 1908 an appropriation of \$7,000 was provided for the purchase of land and construction of a superintendent's residence, ponds, etc., at Cape Vincent, but this money has never been used, and as it is the intention to ask Congress for authority to dispose of the present property when a more desirable site can be found the return of the special appropriation to the Treasury is recommended.

PROPAGATION OF MIGRATORY FISHES OF ATLANTIC STREAMS.

The anadromous fishes of the Atlantic seaboard are handled at two stations in the Chesapeake Basin and two in the Albemarle region, and the principal species handled are shad, striped bass, white perch, and yellow perch.

The run of shad in Chesapeake Bay and tributary streams in the spring of 1914 was smaller than in any previous season within the 35 years covering the Bureau's operations with this species, and the fish-cultural results were correspondingly meager.

On the Susquehanna River preparations were made to cover every field within range of the Battery station where there was a possibility of securing shad eggs by establishing lay-boat patrols in the vicinity of the gill-net operations and detailing experienced spawn takers on the seining shores. The season was a failure, and the total output of shad fry was less than 2,000,000, whereas the efforts put forth and the money expended should have yielded not less than 100,000,000.

As the supply of white perch and yellow perch in the upper part of Chesapeake Bay appears to be increasing, the work with these species was conducted on only a limited scale. Between March 26 and 30, 1914, eggs of the yellow perch numbering 80,762,000 were secured, which yielded 57,400,000 fry and 9,000,000 eyed eggs for shipment to State and private hatcheries. Unusually low temperatures in this river delayed the spawning season of the white perch for about 10 days, but 310,225,000 eggs of that species were collected during the latter half of April and the month of May, producing 218,600,000 fry and 1,450,000 eyed eggs for shipment to New England. In conjunction with the other work, 450,000 alewife eggs were developed as an experiment in the McDonald hatching jars, and from them 184,000 fry were obtained.

On the Potomac River, where the collecting of yellow perch usually starts in February, this work could not be undertaken until the middle of March, owing to the fact that the river was blocked with ice, and the rapidly rising temperatures after that date made it exceedingly difficult to secure sufficient brood fish to produce the usual stock of eggs for the Bryans Point hatchery. However, by constant and persistent effort 15,567 yellow perch had been taken from the fishermen's nets and placed in live cars by March 27, and from them 129,155,000 eggs were obtained. The output for the season was 3,900,000 eyed eggs and 110,224,389 fry, which were distributed in various tributaries of the Potomac River in Maryland and Virginia.

From a financial standpoint the shad season on this river was the poorest ever experienced. None of the commercial fishermen operating haul seines within range of the Bureau's station were able to make expenses, and the catch of fish by the gill-net fishermen was far below the average. Egg collections were made from April 23 to May 20, when the work was discontinued on account of scarcity of fish. The season's work comprised 30,180,000 eggs collected, 27,088,060 hatched, and 611,000 eyed eggs shipped.

In the Albemarle Sound region, where for the past five years the good results of shad propagation and protection have been manifested by a steady and appreciable increase in the annual output of the Edenton station, the work received a check, the output of young shad being only about one-third that of 1913. The poor results may be attributed to several causes, chief among them being the unfavorable weather, which, during the entire spawning season, was too cold to permit of the normal ripening of a large percentage of the fish in the streams. Another unfavorable feature was the unusual scarcity of ripe male fish. At times as many as 100 females with ripe eggs were taken, with only one mature male available, making it necessary to discard eggs in large numbers. The reports received from the lower portion of Albemarle Sound indicated that shad were there in the usual numbers, and it is believed that this setback is only temporary. The total collections of eggs for the Edenton station were 42,885,000, and 29,423,000 fry were the output therefrom.

The hatching facilities of the station were increased during the year by the construction of a new iron-pipe water-supply and drainage system, and the installation of additional hatching tables with a capacity for 200 jars.

Owing to peculiar climatic conditions, the normal spawning season of the striped bass on the Roanoke River, near Weldon, N. C., was prolonged for nearly a month. When egg collections began on April 29 the outlook was discouraging, the catch of fish was small, the river was at a low stage and very clear, and the water was warming so rapidly that numbers of female bass were unduly ripening and casting their eggs in the river many miles below the station. A few days later, following a heavy rain, all these conditions were reversed. The water level in the river was increased over 5 feet, its temperature dropped to normal, and fish with eggs were taken in comparatively large numbers in the vicinity of the various egg-collecting camps. The majority of them were green, however, and male fish, as heretofore, were scarce. At the height of the spawning season (May 12 and 13) over 5,000,000 eggs were taken, and from that time on smaller lots were secured up to May 22, by which date the river was so low and the water so clear that the fish were able to see and avoid the nets. The total egg receipts amounted to 17,290,000 and the output of fry to 11,689,000.

Some penning experiments with the crude facilities at hand were conducted in the course of the spawning season in an effort to solve the greatest problem connected with the artificial propagation of the striped bass—the taking of ripe male and female fish at the same time. Though no positive information on the subject was gained, the results of these experiments gave ground for the belief that under certain conditions the ripening of green fish of both sexes in pens may be successfully accomplished.

CULTIVATION OF MARINE SPECIES.

The hatching of marine fishes and the lobster is done at three stations in Massachusetts and Maine, but the field work for the collection of eggs extends from the Bay of Fundy to Long Island Sound.

The results of the year's operations at the Boothbay Harbor station, though somewhat smaller than had been anticipated in view of the large stock of brood lobsters impounded early in the year, were the largest ever attained on the Maine coast, the number of fry hatched and distributed aggregating 755,557,400.

During the summer and fall of 1913 brood lobsters were so plentiful that 20,349 were collected without difficulty before October, this being more than 3,000 in excess of the number obtained in previous years, even when collections were continued through practically the whole year. It was deemed inadvisable to place more than this number of lobsters in the pound, and as facilities for holding additional stock could not be provided, the collections were discontinued on September 30. On the removal of the lobsters from the pound in April, it was apparent, both from the heavy shrinkage in numbers and from the small crop of eggs carried by the bulk of the females, that too many lobsters had been placed in the inclosure. Only 14,537 survived, the percentage being smaller than in any year since the enlargement of the pound in 1908. The yield of eggs amounted to 150,014,000, or 10,319 per lobster, as opposed to an average of 15,500 in the fiscal year 1913. In the course of the spring 27,642,000 eggs were secured from freshly caught lobsters, and from the total stock 173,500,000 vigorous fry were hatched and distributed.

In order to relieve the crowded condition of the Gloucester hatchery, the steamer *Gannet* was utilized during the early winter in transferring surplus pollock eggs from that point to the Boothbay Harbor station, some of them being carried in scrim boxes in the lobster tank of the vessel and some in transportation cans. While the final results—a total output of 19,233,422 fry from the 88,600,000 eggs handled—would not seem to justify further operations along similar lines, it is believed the experience gained as to the most practicable methods of handling and transferring the eggs will make it possible to prosecute the work on a better basis another season.

Encouraged by the outcome of the haddock operations of the past two years, preparations were made for the propagation of this species on an extensive scale. The season was, however, a failure. Practically no brood haddock were seen, though small immature fish were abundant, and some very good hauls of that size were made by the fishermen. Numerous trips to the fishing grounds in quest of eggs terminated in a total collection of 6,178,000 of very poor quality. From them 894,000 fry were hatched and distributed.

The cod operations at Boothbay Harbor were likewise unsuccessful and for similar reasons. Spawning fish were very scarce on the fishing grounds within reach of the station, and the catch of cod of other sizes was so small as to be unprofitable to the few fisherman conducting operations. The season closed with a total collection of 10,523,000 eggs, which yielded 5,859,000 fry.

In the past years considerable numbers of brood flatfish have been turned over to the Bureau by the cod and haddock fishermen on the Maine coast. Owing to the limited extent of these fisheries the past season no flatfish from that source were available, and the 4,852 spawners constituting the station's brood stock were secured from nets installed and operated by the station force in coves adjacent to Boothbay Harbor and Linekin Bay. Some of the fish were permitted to spawn naturally in the tables, but owing to lack of sufficient table room the greater part were stripped and the eggs artificially fertilized. No difference in results was discernible; the 607,785,000 eggs handled were of uniformly fine quality, and the losses in hatching amounted to only 9 per cent. There being more eggs on hand at the height of the season than could be properly cared for with the available hatching facilities, 100,000,000 were developed in a 10-foot box, which had been divided into five compartments, provided with a scrim lining and scrim bottom, and anchored at the head of the wharf where there was sufficient wave motion to secure a good water circulation through the bottom and the perforated sides of the box. While these eggs developed more slowly than those in the hatchery, owing to difference in water temperature, they hatched just as well and produced fry of excellent quality.

Extensive repairs and improvements, increasing the capacity of the Gloucester hatchery by about 65 per cent, were completed during the early part of the year, and from the opening of the pollock spawning season in November to the end of the fiscal year the station force was constantly occupied in the propagation and distribution of one or more of the five species handled. The total egg collections and the output of fry were the largest in the history of the station, notwithstanding the shortage which occurred in the cod work.

In the prosecution of pollock hatching the schooner *Grampus* was utilized as living quarters for the spawntakers in the field, while the eggs collected were transferred daily from the fishing grounds to the station by the steamer *Blue Wing*. In its early stages the work was not profitable, the collections being small and the eggs inferior in quality. Later, however, their quality improved, and during December the results exceeded all expectations, the daily collections of eggs running from 25,000,000 to 50,000,000. Notwithstanding the increased facilities the hatchery was filled to overflowing, and on several occasions it became necessary to plant some of the older eggs to make room for the enormous incoming collections. The spawning season extended from November 1 to February 6, and resulted in the collection of 974,240,000 eggs. The output included 542,185,000 fry and 116,285,000 eyed eggs transferred to other stations and planted in Gloucester Harbor.

While the collections of cod eggs for the Gloucester station were considerably smaller than those of the previous year, owing principally to the nonappearance of the usual spring run of cod to the inshore fishing grounds in Massachusetts and Ipswich Bays, the number of eggs secured was much larger than the small catch of fish seemed to warrant. During the spawning season—extending from February 1 to April 15—the work was interfered with to some extent by storms, and early in March it became necessary to detach part of the spawn-taking force for the collection of haddock eggs. The receipt of eggs for the season aggregated 91,980,000, and the output of fry amounted to 64,780,000.

Between March 17 and April 18 the spawn takers attached to the Gloucester station collected 206,890,000 haddock eggs from the large gill-net steamers operating on the near-by fishing grounds. The eggs were of fairly good quality, but as hatching operations with the cod and flatfish were in progress, it was necessary to crowd them somewhat in the hatching boxes, thus detracting from the results. One lot of 8,590,000 eggs for which there was no room in the hatchery was planted in the harbor near the station, and from the remaining eggs 107,690,000 fry were hatched and distributed.

The flatfish work was attended by more than the average success. From fyke nets set in Gloucester Harbor and fished daily by the station employees from February 24 to April 15, 563 gravid fish were secured, which yielded 275,350,000 eggs. Lack of the usual hatching facilities necessitated the development of a large percentage of these eggs in scrim floating boxes moored in the harbor near the hatchery. The output of fry for the season numbered 242,010,000.

Of 348 egg-bearing lobsters placed in live cars at the station during the fall of 1913, 264 survived confinement and yielded 3,124,000 eggs when stripped early in May. These were hatched in conjunction with 974,000 eggs taken from lobsters delivered at the station during the spring months, and the results in fry distributed amounted to 2,700,000 at the close of the year, with 1,098,000 eggs still in process of incubation.

Notwithstanding the intense severity of the winter and the nonappearance of the usual run of cod on the spawning grounds in Massachusetts fields, a substantial increase over last year in the collection of cod eggs for the Woods Hole station was realized. In November and December brood cod to the number of 3,127 were

purchased from commercial fishermen and allowed to ripen in the spawning pool at the station, the capacity of which had been enlarged during the summer and fall. The total yield of eggs from this source was 259,366,000. Late in November the steamer *Phalarope*, with a crew of five spawn takers, was stationed near Sagamore, Mass., for the collection of eggs from the cod fishermen operating in that field. Owing to the climatic conditions encountered, however, only 5,276,000 were secured, and on January 9 the field work was abandoned. In the course of the season 4,130,000 eggs were transferred to the Gloucester station, and from the remaining stock 182,312,000 cod fry were hatched and liberated in the coastal waters of Massachusetts.

While the flatfish operations in the fields operated from the Woods Hole station were greatly retarded by unfavorable weather, and fewer eggs were secured than in the previous year, the final results in the number of fry distributed were over twice as great. The installation of fyke nets for the capture of brood fish was not accomplished in southern Massachusetts until late in January, and there were times during the next two months when the nets could not be operated because of accumulations of ice. The severe weather also delayed the work and curtailed the egg collections on the Rhode Island and Connecticut shores. The eggs from all sources numbered 507,440,000 which produced 373,230,000 fry, a hatch of 73 per cent.

The efforts in connection with mackerel hatching at the Woods Hole station were confined to fields in the immediate vicinity; all available spawn was taken from local traps, and from the 6,521,000 eggs secured 2,510,000 fry were hatched and liberated in local waters.

PROPAGATION OF TROUTS AND BASSES.

Spawning operations at the various stations devoted to the propagation of the trouts were highly satisfactory. At the Wytheville, Va., station approximately 2,500,000 rainbow-trout eggs were secured, the largest number ever taken by the Bureau from the domesticated stock of a single station. Substantial gains were also made at the Manchester, Iowa, station in the output of this species, the eggs taken being fully a million in excess of those of the previous year. Collections of eggs from wild rainbow trout in fields contiguous to the Leadville, Colo., and Bozeman, Mont., stations were greatly curtailed by heavy storms and high water in the lakes and streams during the spawning season.

The work with rainbow trout on the Klamath River, Cal., was practically a failure, not because of any diminution in the numbers of brood fish, but because they spawned for the most part in the main river instead of ascending tributary streams where they would have been accessible for egg-taking purposes.

The cultivation of the brook trout in Colorado, which is the only State where extensive collections of eggs are made from wild stock, was conducted under unusually favorable weather conditions, and over 6,000,000 eggs of fine quality were secured. As in previous years, a large part of the brook-trout eggs handled at the Bureau's stations are purchased from dealers, this course having proved more economical in most cases than reliance upon collections from wild fish.

Preparations for the conduct of black-spotted trout work in the Yellowstone Park were taken up in June, but most of the eggs were

collected in July. The weather conditions throughout the spawning season were unusually adverse. A succession of storms, very cold water, and high water in all the streams and lakes operated, resulted in a very short collecting period, and only 7,446,060 eggs were obtained, or only a little over one-fourth of the collections of the previous year.

The results of the operations at the various pond-culture stations during the year were in general satisfactory. While there was a slight falling off in the product of the black basses, considerable gains were made in the output of the sunfishes and other species. It is impossible, however, with the present facilities to produce the basses, crappies, sunfishes, and catfishes in sufficient numbers to meet the constantly increasing demands.

While the game fishes constitute a relatively small percentage of the Bureau's output, their cultivation is valuable as an incentive to private fish culture and for the maintenance in public waters of the supply of fishes that may be taken by anglers. The construction of private ponds and the establishment of large fishing preserves are increasing each year, and the Bureau is relied upon to furnish brood stock for such waters.

RESCUE OF FISHES FROM OVERFLOWED LANDS.

The Bureau has continued the work of rescuing fishes from the temporary lakes and pools formed when the Mississippi River and tributaries subside after the annual freshets. Notwithstanding the gradual extension of the field of operations, the collections from this source have for some time been falling off and in places are appreciably smaller than they were a number of years ago. However, the work during 1914 was more favorable than for several seasons past, and 2,500,000 fish of all species were saved, this number being about three times the collections of the previous year. These fishes, which would inevitably have perished from the drying or freezing of the ponds, were for the most part returned to the main streams; but the basses and allied species thus obtained are relied on to supplement the pond-cultural operations, and are utilized for stocking waters in the contiguous States and other parts of the country.

The important work inaugurated some years ago of rescuing from the Chesapeake & Ohio Canal various food and game fishes that become stranded when the water is drawn off in winter, was prosecuted in the portion of the canal between Point of Rocks, Md., and Shepherdstown, W. Va. Approximately 19,500 adult and fingerling large-mouth and small-mouth black bass, crappie, sunfish, white perch, yellow perch, and catfish were taken and transferred to adjacent portions of the Potomac River.

MISCELLANEOUS FISH-CULTURAL ACTIVITIES.

The hatching of pike perch at the Swanton, Vt., station, though considerably retarded by the late spring, was successful. The egg collections were above the average, amounting in round numbers to 134,000,000, and being of very fine quality. The losses during incubation were small. The most gratifying feature of the work, however, was the outcome of the experiment undertaken the preceding year of holding brood fish to ripen in pens constructed along the shores of Lake Champlain. All previous attempts in this direction had met

with discouraging results, the green fish so held either dying before the eggs matured or, in case they survived, yielding eggs that were almost if not quite worthless. It may be stated, however, that such attempts were confined entirely to crates moored in the Missisquoi River, most of the brood fish for the Swanton station being taken in those waters rather than from the lake. Very soon after the disappearance of ice in the lake in the spring of 1914 a number of decidedly green fish were captured in seines and transferred direct to the pens. They matured rapidly, there was no noteworthy loss, and the eggs were equal in quality to those obtained from ripe fish captured in the river. Nearly 500 green females were thus matured, and more might have been ripened in this way had it not been deemed inadvisable, in view of the unsatisfactory results in the past, to conduct the experiment on too extensive a scale.

Experiments in the artificial propagation of the buffalo-fishes were continued at the Meredosia, Ill., station during the spring of 1914, but the results were almost negative. The low water prevailing in the Illinois River during the spawning season made it exceedingly difficult to secure brood fish, and only one ripe female was obtained; this yielded 300,000 eggs, from which 150,000 fry were hatched. As noted in former attempts to propagate the buffalo-fish, the fry after hatching seem unable to swim from the jars. However, by placing the fully developed eggs in shallow pans just prior to hatching, the heavy losses from smothering which occur when the fry are held in jars with developing eggs were overcome. It is doubtful if any conspicuous results with the buffalo-fishes can be expected until special hatching facilities can be provided and water of a relatively high temperature insured.

The propagation of shad on the Willamette River near Oregon City, Oreg., has become an established feature of the fish-cultural operations on the west coast, but as yet is conducted on only a small scale. The run of shad in the Columbia River and tributary streams during the spring of 1914 was unusually large. On the Willamette River operations began May 27, and 4,062,000 eggs had been secured up to June 30, with the prospect that the season's output would exceed 6,000,000 fry.

EXPERIMENTS IN ACCLIMATIZATION.

Two interesting reciprocal transfers of aquatic creatures between the Atlantic and Pacific coasts have been in progress for several years, and are now being actively pushed in the belief that definite results of a highly practical value will ultimately, perhaps soon, be achieved.

The Atlantic's contribution to the Pacific is the lobster. In November, 1913, 4,007 adult lobsters, about evenly divided as to sex, were transferred from the Bureau's station at Boothbay Harbor, Me., to Seattle, Wash., in one of the standard refrigerator cars of the American Express Co., an attendant accompanying the shipment to give the lobsters proper care. On arriving at Seattle the lobsters were placed on a Puget Sound steamer and conveyed to the San Juan Islands, where they were distributed in excellent condition off Deer Harbor and Friday Harbor. The total losses in transit were only 440. It is felt that the annual planting of some thousands of adult lobsters in a given locality known to have the requisite physical conditions will result in the establishment of a flourishing colony from which offshoots

will naturally spread both north and south, and finally cover an extensive coast line.

In continuation of the efforts to add to the fishery resources of the eastern seaboard by acclimatization of some of the more important food fishes of the Pacific coast, 13,240,000 eggs of the humpback salmon were transferred from Puget Sound, Wash., in October, 1913, for development at the Craig Brook and Green Lake, Me., stations, where special facilities had been provided for handling them. An abnormal loss of eggs and fry occurring at the former station was accounted for by the crowded condition of the hatching troughs; but taking into consideration the large numbers of eggs handled and the fact that they were transported more than 3,000 miles to be hatched, the results of the experiment are regarded as highly successful. The young planted during the fiscal year as fry and fingerlings numbered 7,199,000, and, in addition, 367,900 fingerlings remained on hand at the end of the year and were subsequently distributed. Among the rivers thus stocked are the Penobscot, Androscoggin, Damariscotta, Dennys, Pleasant, Union, Medomak, Georges, and St. Croix.

That the Bureau's efforts to establish the excellent steelhead trout in New England waters have met with success is shown by the increased numbers being taken in the lakes and streams of Vermont. The species has become so well established in Caspian Lake that the State fish commissioner contemplates the construction of a station on the lake for its artificial propagation. Large catches of steelhead have been made in Willoughby Lake and tributary streams in Vermont, a number of specimens weighing up to 6 pounds having been taken from these waters in the spring of 1914. The establishment of the lake trout in Vermont lakes is an interesting outcome of acclimatization experiments. Whitefish from the Great Lakes also have become established in many of the larger lakes of the State and are yearly increasing in numbers.

FISH PONDS ON FARMS.

With the increased cost of living and the growing appreciation of the food value of fish, there is developing a widespread interest in pond culture, both in artificially constructed ponds and in natural inland waters of limited area. This kind of fish culture can be made to produce a ready and economical food supply for the home and to yield also a revenue in conjunction with farming. That such interest is attaining considerable proportions is evidenced by the fact that fully 75 per cent of the 10,502 applications for fish received by the Bureau of Fisheries during the fiscal year 1914 were for species suitable for stocking ponds and other small inland waters.

Much has been done by the Government for the preservation of the country's forests; large tracts of waste land have been reclaimed and made productive through the establishment of immense irrigation plants; water courses have been dammed for the generation of power; and gigantic strides have been made in agriculture and stock raising through the application of scientific methods. In the advancement of these projects, which have such an important bearing on the economic life of the country, the conservation of the fishery resources of the interior have been largely overlooked. Yet the farm lands of

the Middle West and of the Eastern and Southern States embrace many thousands of acres unsuited to agriculture which might economically and profitably be converted into ponds for the cultivation of valuable food fishes. It is to this latter enterprise that the Bureau is giving special attention.

It is very common to see ponds, swamps, and small sheets of water lying entirely useless and marshy meadows producing nothing except a small quantity of inferior grass. With a small amount of labor and capital such places might be transformed into ponds which aside from their value for fish culture would be of material benefit to farmers as reservoirs for the storage of water for irrigation during periods of protracted drought. Moreover, the utilization of waste lands in this manner would decrease to a measurable extent the liability of disastrous floods and tend to equalize the flow of neighboring streams.

In many localities ponds can be made by the damming of small ravines or by the diking of small portions of marshy soil depressions. Such lands are of no value for agriculture, and the benefits of their use for the raising of fish would more than offset the expense of the pond construction. The water supply could be provided by diverting the current of some small stream, utilizing the overflow from a spring, or by the construction of windmills and suitable wells.

In ponds so constructed, where the water temperature does not fall below 50° F. in the spawning season, the black basses, crappies, sunfishes, catfishes, and other species can be successfully cultivated with a comparatively small expenditure of time and money.

The Bureau has in many ways endeavored to encourage the raising of food fish on farms; and it will not only supply consignments of young fish for stocking ponds, but will gladly furnish such information as may be needed to insure the success of the undertaking.

If people desiring fish, either for stocking ponds or for public waters, will make the fact known to the Bureau, they will be supplied with blanks upon which to submit formal application, and at the proper distributing season a sufficient number of young fish for a brood stock, of a species adapted to the waters described, will be delivered free of charge at the applicant's railroad station. All that is asked in return is that the fish shall receive adequate attention and protection, and that the applicant submit a report from time to time as to the results of the undertaking.

COOPERATIVE STOCKING OF NATIONAL PARKS AND FORESTS.

The Bureau has undertaken cooperative work with the Department of the Interior and the Department of Agriculture, with the view of stocking with suitable food and game fishes the various waters within the boundaries of the national parks and forests of the country, and a comprehensive plan covering such work has been agreed upon. Prior to this time no definite or sustained policy looking to maintaining and increasing the fish supply in these vast areas had ever been followed; and no adequate attention has been given to the opportunities that are presented for augmenting the attractiveness and usefulness of the national parks and forests.

As regards the following national parks, the Bureau has already made investigations which afford information concerning their present fish fauna and the species whose introduction is best suited

therefor: Sequoia, Cal.; Mesa Verde, Colo.; Glacier, Mont.; Crater Lake, Oreg.; Wind Cave, S. Dak.; and Yellowstone, Wyo. It has been determined to make annual distribution of fish for a period of 9 or 10 years in each of these parks. Inasmuch as there have been extensive fish-cultural operations in the Yellowstone Park for a number of years, no additional steps are necessary for maintaining the fish supply in that territory.

No fishery explorations have yet been made in the Yosemite, General Grant, Platt, and Mount Rainier Parks; but as soon as practicable the streams and lakes therein will be examined and the matter of stocking them will receive careful attention.

The arrangements thus far made with the Forest Service contemplate annual plants of fish in some 700 lakes and streams in those portions of Colorado and Wyoming embracing the forest reservations of Arapahoe, Battlement, Big Horn, Bonnevill, Bridger, Cochetopa, Colorado, Durango, Gunnison, Hayden, Holy Cross, Leadville, Medicine Bow, Montezuma, Pike, Rio Grande, Routt, San Isabel, San Juan, Shoshone, Sopris, Uncompahgre, Washakie, and White River.

In making distributions in the national parks and forests, the fish will be delivered at the railroad stations nearest the waters to be stocked, and the park superintendents or forest rangers will transport them thence to the waters for which destined. This plan will facilitate the distributions of fish in isolated lakes and streams in the mountains, which could not be reached directly by the Bureau without entailing heavy expense. As the national parks and forests are located for the most part in mountainous districts, the various species of trout are best adapted for stocking them.

SURVEYS, INVESTIGATIONS, AND EXPERIMENTS.

OCEANOGRAPHIC INVESTIGATIONS.

Oceanography, which embraces the biology, physics, and chemistry of the sea, has been used with considerable effect in the elucidation of obscure fishery problems, especially in the North Sea. The Bureau has recently improved its equipment for such work and is systematizing its methods and plan of operation along the lines which experience elsewhere has shown to be effective.

During the summer of 1913 the schooner *Grampus* was engaged in investigations of this character between the Gulf of Maine and the capes of the Chesapeake, incidentally discovering the scallop beds which have been elsewhere referred to. During February and March the Bureau cooperated with the Coast and Geodetic Survey in an oceanographic expedition from the capes of the Chesapeake to Bermuda and thence to the coast of Florida, including several lines of observation across the Gulf Stream as far south as Key West and Habana. These two projects resulted in the collection of a large amount of data and many specimens which there has not yet been time to collate and study. It is evident, however, that the work will not only result in the accumulation of much information in regard to ocean currents, salinities, and temperatures, all of which are important in the distribution of fishes and the determination of the locale of fisheries, but there has been a more direct gain in the knowl-

edge of the spawning grounds, early life, and food of certain species. The physical and chemical data are also of value to navigation through the light which they throw on the direction and velocity of ocean currents.

As the only Government agency having personnel and equipment for such duty, the Bureau was called on in the spring of 1914 to place an oceanographical observer on the revenue cutter *Seneca* engaged in ice patrol and observation on the trans-Atlantic steamship lanes in accordance with an international agreement. The importance of this work appears to have been strongly appreciated by those participating in the International Maritime Conference in London, and it is believed that it will eventually do much to clear up the source and movements of icebergs under the influence of currents. The biological observations as they accumulate and are studied and digested will possibly be better criteria than the physical data, for the plankton organisms, floating plants, and animals, in effect are so many myriad "drift bottles," which can be identified and traced to their source wherever found, while the physical and chemical qualities of the water become confused and blended by the interference and fusion of the various oceanic currents. As most of this work is conducted on or adjacent to the great fisheries of the Grand Banks of Newfoundland, the information acquired will be valuable to the fisheries themselves.

The various phases of work indicated in this section of the report have been so coordinated that, supplemented by the similar investigations in Chesapeake Bay and in North Carolina, elsewhere referred to, they cover practically the whole Atlantic coast from the Grand Banks to Key West, and constitute the most complete and consistent work of the kind which has ever been undertaken in the waters of the western Atlantic.

INVESTIGATIONS OF COASTAL WATERS.

Oceanographic investigations by the fishery schooner *Grampus* having indicated the presence of large scallop beds off the southern New England and middle Atlantic coasts, the vessel was detailed for a more thorough examination, which divulged the existence of a valuable mollusk in commercial quantities in several places. One of the most productive beds reaches to within 40 miles of Sandy Hook, and as it covers a large area and is readily accessible, it is believed that it will eventually support a lucrative fishery. A circular calling attention to the possibilities was issued and widely distributed.

In 1902 the Bureau made a reconnoissance of a fishing bank off Beaufort, N. C., which demonstrated the abundance thereon of sea bass or blackfish. The information was not specifically called to the attention of the fishermen and was not availed of, but during 1913 certain fishermen were induced to try this bank. As an indication of the value of these grounds it may be noted that two fishermen, between June 18 and November 22, made 23 trips 20 miles to sea in a 20-foot, open, power dory, and although they could remain but a few hours on the grounds, they averaged about 600 pounds of fish to the trip. Their minimum catch was 170 pounds, the maximum 1,000 pounds; and in the week ending November 22, in four trips, they took 3,400 pounds, for which they received an equivalent

of \$238, f. o. b. Beaufort, as the proceeds of a week's work. They have just built and launched a seagoing gasoline boat, with auxiliary sails, which will enable them to remain on the fishing grounds overnight and much increase the efficiency and profit of their operations.

The outlook was regarded as favorable to the development of a remunerative sea-bass fishery, and the steamer *Fish Hawk* was detailed for further examinations. A number of other banks were found and reported on, and a circular was issued furnishing information as to their location and productiveness. At the end of the fiscal year arrangements were made to place a buoy on the principal bank to assist the fishermen in locating the most productive grounds.

During the winter and spring of 1914 the *Fish Hawk* carried on a series of biological and physical investigations of Chesapeake Bay in connection with a study of the habits and distribution of the fishes of the region. Some significant and unexpected facts concerning the distribution of the salinities and temperatures of the water were developed, and there is strong indication that the continuance of the work will show the causes for a heavy winter death rate among the young fishes and the reasons for irregularities and deficiencies in the annual runs of the shad and other anadromous fishes. In connection with this work, facilities were furnished on the *Fish Hawk* to the Department of Agriculture for a sanitary survey of the oyster beds, a subject of much importance to the public and the oystermen.

The presence of the halibut off the coast of Oregon and Washington having become known, the fishermen of those States requested an investigation to determine whether the supply was sufficiently abundant and regular to warrant equipment for a large fishery. Accordingly, in the spring of 1914, the repairs to the *Albatross* having been completed, that vessel, with her regular personnel and a party of experienced halibut fishermen, was ordered to make a survey, employing both her regular equipment and the practical gear of the commercial fisheries. The work was interrupted in June, but resumed later in the summer and prosecuted until the weather forbade. The results so far attained do not indicate the continuous occurrence of large bodies of halibut off that part of the coast, but the determination of even this negative fact will be valuable by preventing unwarranted expansion and needless expenditure by the fishing interests.

In connection with the recently developed commercial fishery for the small tuna, or long-finned albacore, in southern California, the fishermen and cannerymen are growing concerned as to the volume and continuance of the supply. To determine the facts and, if possible, to discover more extensive bodies of fish offshore, the Bureau, at the urgent request of those engaged in the business, has undertaken an investigation. It was commenced near the close of the fiscal year by an assistant operating from the shore, but it will be taken up by the *Albatross* at the close of her halibut survey and will be continued throughout the current year.

The shrimp of the Gulf and South Atlantic coasts supports one of the most important of the minor marine fisheries, and in certain regions the supply shows indications of depletion. Nothing is known of the spawning and very little of the other habits of this crustacean, and to serve as a basis for regulative legislation and other possible measures of conservation a study of the natural history of the species was commenced near the close of the fiscal year.

INVESTIGATIONS OF LAKES AND STREAMS.

The investigations of lakes in Washington and Idaho, begun during the fiscal year 1912, were brought to a close pending the submittal of the report of the investigators and an analysis of the scientific and practical results. The report has not yet been completed, but preliminary memoranda indicate that it will contain matter and recommendations of value to fish culture, particularly as a guide to the species of fishes which it will be profitable to plant in those waters.

In Wisconsin, where the Bureau is cooperating with the State Geological and Natural History Survey in an investigation of the lakes, the work is being conducted in great detail, and with strict attention to scientific accuracy in an attempt to discover the fundamental, physical, and biological conditions of lacustrine life. This research, which requires but a small expenditure, under the cooperative arrangement, will eventually establish a foundation for the better understanding of lake phenomena in other regions.

A biological and fishery examination of Lake Champlain, commenced during the year in cooperation with the Vermont State Fish Commission, was suspended at the close of the summer, but will be concluded during the next fiscal year. It has as its primary purpose the determination of the feasibility of establishing a commercial fishery for certain species of fishes without detriment to the sporting interests on the lake which are a valuable asset to the people of Vermont and New York.

Minor inquiries were conducted in Tuxedo Lake, N. Y., in respect to the maturation and spawning of chinook salmon, and in the small lakes and artesian-well ponds of North and South Dakota to determine their suitability for the planting of fishes. The latter work was not completed, owing to the resignation of the assistant assigned to it.

The construction of the great dam in the Mississippi River at Keokuk, Iowa, has resulted in the production of a long narrow body of water known as Lake Cooper, which in its general physical characteristics resembles Lake Pepin, a natural expansion in the course of the same stream in Wisconsin and Minnesota. In its fisheries Lake Pepin is the most productive part of the Mississippi River, and it appears probable that with proper treatment the new artificial lake may be equally valuable and serve a useful purpose supplemental to its primary use for hydroelectric power generation. To supply the information necessary to aid steps to this end, the lake has been placed under observation, and at the end of the fiscal year arrangements had been made for the investigation of the plants and microscopic animal food. It is hoped that the results will be sufficiently favorable to warrant the planting of fishes and larval mussels therein during the current year. Coincident with this work a study was made of the effects of the dam and locks on the movements of migratory fishes, in the expectation, already partly realized, of adding to knowledge respecting the general principles of a successful and efficient fishway.

Continuing the survey of the fresh-water mussel resources of the Mississippi Valley, investigations were conducted in the upper Missouri River drainage system and in the Ohio River valley. The latter inquiry is in progress at the close of the fiscal year. The publi-

cations embracing the results of this series of investigations have been very favorably received by the pearl-mussel interests, and in some cases have opened new fields to industry. In connection with these studies and the deductions based on them, the question of the protection of the mussel fisheries has received critical attention, and a report on constructive and conservative legislation has been issued and brought to the attention of the authorities of the States having mussel resources.

Of interest to fish culturists are the experiments being conducted at Homer, Minn., to determine the feasibility of propagating amphipods, or water fleas, in sufficient quantities to be economically available as food for young fish, of which they constitute a natural diet.

The study of the salmons of the Pacific coast has been continued, and in June, 1914, a temporary assistant was employed to take up systematically an inquiry into the life history of the species of the Sacramento and Columbia Rivers mainly through the study of the scales, the new means which science has placed at the disposal of such inquiries.

FRESH-WATER MUSSEL CULTURE.

The propagation of fresh-water pearly mussels, which is a recent development of the Bureau's work, already has assumed important proportions. In this the second year of its active prosecution, 227,536,814 glochidia or larval mussels were planted, an increase of 50 per cent over the output of the preceding year. Of these 86,026,000 were planted in the Mississippi River in the vicinity of Fairport, Iowa; 7,316,000 in the same stream near La Crosse, Wis.; 101,136,200 in Lake Pepin, Minn.; 8,840,000 in Black River, Ark.; 4,726,000 in White River, Ark.; and 19,258,000 in Wabash River, Ind., in addition to which smaller experimental plants were made in Grand River, Mich.; Lake Pokegama, Minn.; and Maumee River, Ind.

As is now generally known, these larval mussels are parasitic on fishes, and to carry the number of glochidia indicated 167,819 fishes were infected and liberated in the streams. Of this number 66,645 were rescued from the overflowed lands, where they would otherwise have perished, and as these were all adults, and in most cases valuable species, this number of breeding fishes was incidentally saved for the maintenance of the food supply of the streams in which they were placed. This in itself would almost warrant the expenditure incurred, but disregarding it, and charging all expenses to mussel culture alone, the cost of the glochidia planted in the streams was 4.3 cents per thousand, as compared with 7 cents in the preceding year. This includes, in both cases, overhead charges for maintenance and depreciation of the plant employed and supervision of the work. These statistics are presented, not to show the value of mussel culture, but to indicate that it is being conducted on such scale and with such efficiency as will measure its utility in due time.

Those engaged in the fishery already report an increase in the abundance of young mussels on the beds, and they attribute the fact to the Bureau's operations, but those in charge of the work believe that it will be several years at least before conclusive evidence of the benefits will be available. It should be remembered, moreover, that while the larval mussels are planted in more or less circumscribed localities in the Mississippi River system, the fact that they are car-

ried for several weeks by more or less strong-swimming and nomadic fishes assures that they will be given more general distribution than a mere statement of the places of deposit would indicate.

The scientific investigations conducted at the Fairport laboratory, elsewhere reported, are gradually improving the methods of mussel culture and making it possible to propagate valuable species which for lack of knowledge presented difficulties when the work was initiated. The experiments have in fact reached a stage where the practical cultivation of certain valuable mussels can now be instituted, and special financial support for this work is provided for in the appropriations for the fiscal year 1915.

POLLUTION OF WATERS.

The matter of the pollution of lakes and streams each year is attracting more attention from both sanitary and industrial viewpoints, and the demands for investigation and relief which the Bureau receives from fishermen, sportsmen, and the general public yearly become more numerous and insistent. While the Bureau has not been provided with the necessary means for properly performing its duty in this respect, it has made every effort to do what is possible and has carried on several investigations during the year.

The research conducted in the Illinois River in cooperation with the Illinois Natural History Survey, with particular reference to the effects of the discharge from the Chicago Drainage Canal, was brought to a successful conclusion during the year by the publication of a valuable report at the expense of the State. This renders available much new data bearing on the effects of sewage pollution of streams, and the results to the fisheries and its findings are in general applicable to other streams carrying large quantities of domestic and municipal sewage.

Complaint having reached the Bureau that oil refineries and tank steamers were polluting the Delaware River to the detriment of the fisheries, a brief inquiry was made into the facts. It was found that some of the refineries discharged but little oil into the stream, but that the "separators" of others were inadequate or inefficiently operated, with considerable resultant contamination of the water. No oil steamers entered the river during the inquiry, but there is but little doubt that more or less oil is discharged when the water ballast is pumped from the tanks after they pass the breakwater at the mouth of the bay. As no fishery of importance was being conducted at the time, the effects of the oil, which was spread on the water in films of considerable area, could not be ascertained. It is probable that it affects the salability of the fish rather more than their movements and distribution.

During the spring an investigation was made into the newspaper and personal allegations that the Government powder factory at Indian Head, Md., was discharging substances which have killed large numbers of fishes in Mattawoman Creek and the adjacent part of the Potomac River. It was found that while the materials complained of were toxic to fishes in solutions of considerable attenuation, no fish were being killed by the normal quantities being discharged at the time of the examination, and that sunfishes were spawning on the creek at a place opposite the point of discharge. It appeared that

excessive discharges, and even the normal discharges at times of low water, might prove dangerous; and representations to that effect having been made to the Secretary of the Navy, measures were taken to remedy the conditions.

EXPERIMENTS IN TERRAPIN CULTURE.

Although the feasibility of breeding and raising terrapin under artificial conditions in inclosures has been demonstrated at the Beaufort, N. C., laboratory, experimental work has been continued for the improvement of methods of feeding, testing the possibility of developing a superior race for breeding, and for other purposes important to the commercial success of terrapin farming. It has been found that while the rapidity of growth can be stimulated by winter feeding and the prevention of hibernation, there is considerable individual variation in the rate of growth, and it is believed that by breeding from the more forward individuals there may be developed a culture strain which will reach a merchantable size at a considerable earlier age than the average in a state of nature.

The Bureau has furnished specimens of its young terrapin for experiment and observation in Florida, to determine whether the more valuable northern species will live and thrive under southern climatic conditions, and it has liberated several hundred yearlings and 2-year-olds in a circumscribed locality in Chesapeake Bay to test the feasibility of restocking depleted natural waters.

The results obtained at the Beaufort laboratory have been sufficiently promising to enlist private capital, and there is now established near there a commercial farm with a breeding stock of several thousand. Although these brood terrapin were brought together after the breeding season was well advanced, about 700 eggs were deposited and hatched. On the advice of the Bureau's terrapin culturist the young were fed during the winter on fresh food, and in consequence their growth has far exceeded that of the experimental broods fed on salt fish, although the mortality was somewhat higher, probably from overfeeding. The results to date are such as to confirm belief in the commercial profit of terrapin farming.

THE FISHERIES LABORATORIES.

Woods Hole, Mass.—The investigations of the sea mussel and the dogfish were continued during the summer of 1913, and the practical campaign to induce the commercial utilization of these waste sea products is referred to elsewhere in this report.

Through the service of temporary employees a number of other investigations were conducted, among them an inquiry into the cause of "green gill" in oysters, an affection which, while harmless, causes much loss to oyster growers by destroying the salability of their product on account of the prejudice of the public against the consumption of the oysters affected. Studies were also made of the life histories of the drill and other oyster enemies in the hope of discovering some stage or habit through which they may prove vulnerable to measures for their destruction.

To secure definite experimental knowledge for use in the correction or prevention of water pollutions inimical to fishes, tests were made of

the toxicity of various mineral matters likely to find their way into streams, and as opportunity offers the studies will be extended to other common water contaminations. There is a growing public demand for specific information of this character.

Correlated with this subject was a research into the oxygen requirements of fishes. Sewage and other decaying organic matter by its oxidation reduces the free oxygen in the water, and in that way may either kill fishes or drive them away. The subject may also be of importance in preventing the wasteful use of water at hatcheries.

Beaufort, N. C.—During the year this station was given some much-needed repairs, the buildings were repainted, a new gasoline-motor launch, with accommodations for extended trips, was provided, and the general equipment was increased and improved in a number of ways conducive to efficiency.

In the preceding year a considerable accretion from harbor-dredging operations had been made to Pivers Island, on which the laboratory stands, and this material was regraded and fixed by planting grass and constructing windbreaks, with the result that the Bureau's property available for buildings and general purposes has been very materially increased.

The experiments in diamond-back terrapin culture, and the exploitation and location of the fishing grounds by the steamer *Fish Hawk* while detailed to the station, have been mentioned elsewhere, with their attendant commercial results.

The southern flounder, an excellent food fish, having been discovered in spawning condition, an experimental hatching apparatus was set up for use during the spring of 1914, but no ripe fish could be obtained. It is purposed to continue the experiments with the flounder and other commercial fishes, and, if possible, to utilize the plant as a fish hatchery, particularly when its other activities are at a minimum.

During the summer of 1913 the methods of the scientific work of the station were partially reorganized so as to bring them into closer accord with the other activities of the Bureau. The researches have been more closely coordinated, so as to attack the several problems from various sides simultaneously, and utilize more advantageously and with less effort the facilities and material available.

Special attention was paid to the collection and classification of data relating to fishes, their distribution in the region, their movements, food, enemies, spawning, and growth. Complete records were obtained of the time of spawning and the embryological and larval growth of two species, and incomplete histories of six others. To secure data for legislative purposes, critical studies of the rate of growth of fishes and the relations of weight to size at different ages were undertaken, and the work on the determination of the ages and other facts of the life histories of fishes, as revealed by the scale markings, was continued from the preceding year. These latter researches offer a most promising means for revealing facts, a knowledge of which is necessarily antecedent to effective measures for fisheries conservation. The study of the food and feeding of fishes was undertaken by several investigators, each studying a special group of organisms. Interesting results were obtained from experiments to determine the extent and character of the flounder's adaptation of its color to its environment, and the work will be continued to establish to what extent the color modifications serve as a protection to the fish.

The edible crab supply is apparently becoming depleted, but its habits are not sufficiently well known to make it possible to propose conservative measures without danger of unnecessarily injuring the fishery. To endeavor to supply part of the needed information, a temporary assistant began studies and experiments during the year.

For several summers tests have been conducted at the laboratory to determine the feasibility of protecting wood from marine borers by impregnating it with solutions of metals and other substances. At the end of the fiscal year cooperative arrangements were established with the Forest Service for the further prosecution of the work.

Owing to delay in passage of the annual appropriation bill, the operations of the laboratory near the end of the fiscal year were seriously interfered with by uncertainty as to funds for the continuance of such work as might be begun.

Fairport, Iowa.—This station, which combines the facilities of a laboratory for research and experiment with the equipment of a station for extensive practical work in fish and mussel culture, is now complete in all its essential features, and its further development will consist mainly in the extension of its equipment and activities. The fisheries of the Mississippi Valley have never reached the development of which they appear susceptible, nor have they received at the hands of the Bureau the study, experiment, and close attention which must be antecedent to their rational conservation and legitimate increase. In large measure this has been due to the absence of close continuous contact between this office and the fishery interests, and the consequent lack of a full understanding of the conditions and requirements. This deficiency the Fairport station now corrects and the effect is already apparent in the confidence and interest which the people are exhibiting in the work, and the more direct and economical application of the Bureau's activities to the regional requirements. It is the purpose to extend the benefits of the station to the entire Mississippi Valley by making it the center for all activities not connected with the regular fish-cultural operations.

In addition to the fisheries work, with which the Bureau is directly concerned, it is proposed to make the laboratory of general scientific and educational value by extending its facilities, under proper regulation, to qualified investigators in the realm of fresh-water biology.

The station, which occupies a reservation of about 60 acres, is equipped with good laboratory facilities for biological and chemical research, ponds and tanks for experimental and practical fish and mussel culture, an efficient pumping plant, and copious supply of crude and filtered water, a practical shell-testing plant and machine shop, launches, boats, and fishing gear, and the living accommodations for employees, made necessary by the inadequate accommodations of the adjacent community. In addition to mussel culture on a large scale, investigations of mussel resources of various streams, a study of the effects on the fisheries of Keokuk Dam and the possibilities created by its backwater in Lake Cooper, and a canvass of the extent and value of the mussel industry, various scientific researches were conducted at the laboratory. The general conditions under which three important species of mussels may be propagated were practically established, and some progress was made in rearing young mussels beyond the parasitic state and in determining the

rate of growth of both young and adults. These researches enlarge the field of practical mussel culture.

Experiments to discover a use for large quantities of mussel meats, now wasted; investigations into the conditions controlling the production of lustrous, and therefore valuable, shells; and studies of the food of mussels, and of their parasites, were carried on as part of the progressive and constructive work necessary to a full utilization of the mussel resources of the country.

FUR-SEAL SERVICE.

The administration of affairs on and connected with the Pribilof Islands has been conducted in accordance with law and regulations. The annual supplies required for the maintenance of Government property and for the support of the native inhabitants were delivered in the early part of the year. Medical attention has been furnished the natives, and excellent schools have been maintained for the native children.

After giving careful consideration to the relative advantages possessed by San Francisco and Seattle as bases for the purchasing of annual supplies for the Pribilof Islands, the latter city was selected. A private steamer was chartered to take the supplies, and left Seattle in the latter part of June, 1914.

The wireless station maintained by the Navy Department on St. Paul Island was in operation throughout the year. This station, by furnishing a means of communication with that island, is almost indispensable, especially in the late fall, winter, and early spring, when no vessels go to or from the islands. The Navy Department has also a small station on St. George, which enables that island to keep in communication with St. Paul. During a considerable part of the year the St. George station was in charge of G. Dallas Hanna, who voluntarily assumed this duty in addition to acting as school teacher.

The killing of fur seals on the Pribilof Islands was limited to young males needed for supplying food to the native inhabitants. The Secretary authorized the utilization of 3,000 for this purpose during the season of 1913, and later, in the fall and winter, gave permission to take additional seals. The seals killed fell short of the limit. The annual shipment of skins, made in August, 1913, on the chartered vessel that carried supplies to the islands, comprised 2,296 skins. These were landed at San Francisco, and shipped thence to St. Louis, where most of them were sold at public auction on December 16, 1913.

All previous sales of fur-seal skins taken under the immediate supervision of the Government on the Pribilof Islands had been conducted in London. In 1913 the Department, after giving due consideration to all phases of the question, decided to initiate the selling of the skins in this country. The number of skins to be sold was relatively small, and for that reason the occasion was considered favorable for making what was in some measure an experiment. It was felt that if the Government could realize even approximately the same net returns from the sale of the skins in this country as might accrue from their sale in London, the establishment of an American market was demanded by sound economic principles.

At the request of the chairman of the House of Representatives Committee on Expenditures in the Department of Commerce, 400

of the skins were withheld from sale. The remainder, numbering 1,896, brought \$54,579 gross, and about \$50,950 net. The fur trade of the world being unsettled at the time and many of the skins being of rather poor quality, the result of this experiment was regarded as entirely satisfactory. The sale attracted much attention and was attended by many buyers from Europe and America.

In the summer of 1913 a special investigation of the fur seals on the Pribilof Islands was made by George A. Clark, who had conducted similar investigations on a number of previous occasions. The results of his enumeration of the seal herd were given in the last report of the Bureau, although the work was not completed until the fiscal year 1913-14. The figures showing the components of the herd in the summer of 1913 are here given:

| | |
|---|--------|
| Active bulls, with harems (actual count)..... | 1,403 |
| Idle and young bulls (actual count)..... | 364 |
| Bachelors, 1, 2, 3, and 4 years old (count and estimate)..... | 47,000 |
| Cows, 1 and 2 years old (count and estimate)..... | 35,000 |
| Breeding cows (equal to pups)..... | 92,269 |
| Pups (actual count)..... | 92,269 |

| | |
|------------|---------|
| Total..... | 268,305 |
|------------|---------|

The North Pacific Sealing Convention of July 7, 1911, effective December 15, 1911, and the act of August 24, 1912, giving effect to that convention, permit Indians dwelling on the western coast of North America to take fur-seal skins under certain conditions. As far as this Bureau is advised, no skins have been so taken by the Alaska Indians since the convention became effective. In April and May, 1913, Indians dwelling on the coast of Washington secured 91 skins, and the Department of the Interior has advised that in April, 1914, those Indians secured 14 skins. Reports as to the sex of the seals from which these skins were taken show that for 1913 ninety were females and for 1914 twelve were females.

Due effort was made to enforce the prohibition upon pelagic sealing and, it is believed, with success. Throughout the season when pelagic-sealing operations were possible, the United States Revenue-Cutter Service has maintained an efficient patrol for the prevention of such operations, three vessels being assigned to the work in 1913 and 1914. These vessels also render great service to the Bureau in connection with its administration of the Pribilof Islands by transporting mail, officials, and limited quantities of supplies. Early in the calendar year 1914 there came to the Bureau information which seemed to indicate that certain persons contemplated engaging in pelagic sealing during the coming season. Orders were issued promptly to various officers of the Bureau to inform themselves regarding any plans to carry on illegal sealing operations and to keep the Bureau fully advised in reference to the matter. Nothing definite was learned, however, in reference to any proposed illegal operations.

In January, 1914, the Commissioner of Fisheries recommended to the Secretary the nomination by outside agencies of three duly qualified persons, not previously identified with fur-seal matters, to whom should be intrusted a full investigation of the fur-seal herd. This was done that the Department might have for its guidance and be in position to submit to Congress data and recommendations regarding the Alaskan seals which would not be open to criticism as coming from persons

who had been parties to the long controversy and who might therefore be regarded by Congress as committed in advance to a particular line of policy. It was felt that those who had investigated the subject, and had frequently made known their findings and views, would welcome a new inquiry, the verification of the facts established by previous scientists, and recommendations based on the new conditions that are now affecting the herd. Pursuant to this recommendation the Secretary requested the Secretary of Agriculture and the Secretary of the Smithsonian Institution each to name an expert, and the President of the United States invoked the aid of the National Academy of Sciences to the same end. In due time the nominations were made, as follows: By the Secretary of Agriculture, Edward A. Preble, of the Bureau of Biological Survey, Department of Agriculture; by the Secretary of the Smithsonian Institution, Wilfred H. Osgood, of the Field Museum of Natural History, Chicago; by the National Academy of Sciences, Prof. George H. Parker, of Harvard University. Formal appointment of these gentlemen as special assistants was made, full individual and joint instructions were issued, and they left for the seal islands on a revenue cutter sailing from Seattle early in June, 1914. A detailed report, with recommendations, is expected from these assistants as soon as their inquiries are completed.

Independently of the dispatch of these special investigators on behalf of the United States, the British and Japanese Governments intimated their desire to send experts to the seal islands, and the Bureau took steps to provide transportation and other facilities therefor.

MINOR FUR-BEARING ANIMALS OF ALASKA.

Owing to a defect in the act containing the appropriations for the Bureau, considerable embarrassment was experienced at the beginning of the fiscal year in regard to the enforcement of the law protecting the fur-bearing animals of Alaska. The act contained no authority for expenses of the warden service, but a later deficiency bill made available a certain sum for this purpose, and the work thereafter was pushed actively. A number of cases of violations of law and regulations—including the killing of beaver, the poisoning of foxes, and the possession of unprime skins—were successfully prosecuted.

The recent impetus given to the business of rearing fur-bearing animals in captivity resulted in numerous requests for permission to capture animals in the close season for use for such purposes. The Department decided that the proper development of the fur-farming industry in Alaska demanded that some provision be made for the taking of certain fur-bearing animals for use for breeding purposes in Alaska during a portion of the season when the killing of such animals is prohibited. By the revised regulations for the protection of fur-bearing animals in Alaska, promulgated as Department Circular No. 246, second edition, under date of June 22, 1914, the taking alive of land otter and mink for use for breeding purposes in Alaska is permitted except in the season from April 1 to June 30, both days inclusive, of each year; and of foxes and marten except in the season from March 15 to June 30, both days inclusive, of each year. It is assumed that the wide latitude allowed for the taking of these animals for breeding purposes in Alaska is amply sufficient for the needs of all

persons who may engage in breeding and raising those animals in that Territory.

The revised regulations also require that all persons engaged in Alaska in the business of breeding and raising fur-bearing animals in captivity shall first obtain from the Department of Commerce a license for that purpose. Permits will be issued to the owners and operators of such licensed fur farms or ranches in Alaska authorizing them to ship their ranch-bred stock from the Territory of Alaska.

In view of the injury done to the animals on the Afognak Reservation by the eruption of Mount Katmai, it has been decided to establish an absolute close season for foxes and land otters for a series of years. Under the terms of Department Circular No. 252, issued October 29, 1913, the pursuit, capture, or killing of foxes within the reservation is prohibited until November 16, 1918, and of land otters until November 16, 1915.

During the fiscal year formal permits relative to fur-bearing animals were issued as follows: (a) three permits authorizing the shipment of black bears from Alaska; (b) one permit authorizing the shipment of lynx from Alaska; (c) two permits authorizing the shipment of marten from Alaska; (d) one permit authorizing the collecting of specimens for the use of the Museum of Comparative Zoology, Cambridge, Mass.; (e) 31 permits authorizing the shipment of ranch-bred foxes from Alaska, the permits being issued to 16 different parties and covering 910 foxes; and (f) one permit authorizing the shipment of silver-gray foxes from Alaska (source of foxes not stated).

Twelve islands lying off the Alaskan coast have been offered for lease, for fox-breeding purposes, for periods of five years, in accordance with law and pursuant to Executive Order dated February 2, 1904. In response to a circular announcement issued in 1913, bids for Little Koniui Island and Carlson Island, at \$205 and \$200 per annum, were received and accepted. A second circular announcement dated January 1, 1914, inviting proposals for leasing the remaining 10 islands, resulted in bids for 3 islands at \$200, \$205, and \$250 per annum which will probably be approved. The offer of the Department to supply blue foxes for breeding purposes from the herds on the Pribilof Islands elicited a number of competitive bids, the highest being \$151 apiece for selected animals. Some deliveries have been made, but the plan presents a number of difficulties connected with the shipment of the foxes from the islands and the care of them in transit.

A limited number of blue foxes were taken from the Government herds on the Pribilof Islands in the winter of 1912-13, and their pelts shipped to St. Louis and sold at public auction. The skins numbered 436, and brought \$17,552.

The present general law for the protection of fur-bearing animals in Alaska has been found quite inadequate in many respects for the purpose for which it was intended. This law forbids only the actual killing of those animals and does not clearly empower the Government to take certain steps necessary to check operations of various kinds quite as detrimental to the conservation of those animals as the actual killing would be. The Government should be specifically empowered to regulate the capturing of fur-bearing animals so as to prevent the needless destruction of burrows, to prevent the taking of fox pups by irresponsible parties under circumstances which inev-

itably result in the death of numerous young ones, and to take other rational steps which are recognized by every informed person as necessary to protect the various species of fur bearers. The Department is endeavoring to conserve and extend in every proper way the fur industry of Alaska. This applies both to the preservation of the natural wild stock (which must furnish a not inconsiderable portion of the means of livelihood to many of the natives of Alaska) and to the building up of an additional fur industry through the domestication of fur-bearing animals under private auspices. It is hoped that a bill drafted by the Bureau and now pending in Congress, which meets the existing situation, may speedily be enacted into law.

ALASKA FISHERIES SERVICE.

The Bureau has labored to enforce the law and regulations for the protection of the fisheries of Alaska to the full extent of the facilities provided by Congress. During the fishing season of 1913 a number of fur wardens and employees in the fish-cultural branch of the service were detailed to assist in this work.

In the summer of 1913 the Bureau was enabled to utilize for the first time a vessel of its own for inspection work. This vessel, the *Osprey*, purchased the previous year, is a steam craft 72 feet in length, and carries a crew of six men. During the winter of 1912-13 it was kept at Semiahmoo, Wash., but in July, 1913, it was put in commission and at once proceeded to Alaska where it has been in continuous service since.

During the period of most extensive salmon fishing operations in southeast Alaska, a special patrol was maintained for securing enforcement of the law and regulations. In addition to the *Osprey*, there were employed on this patrol a number of private power boats chartered by the Bureau for short periods, and a launch attached to the Yes Bay hatchery rendered service in waters adjacent to that station. Arrangements were made to continue this patrol work under similar lines in 1914. This is the only part of the long coast line of Alaska on which even an approximately satisfactory enforcement of law is possible.

The usual census of red salmon ascending Wood River was taken in 1913, and indicated an increase in the run amounting to 100 per cent as compared with 1912. The figures, however, are not conclusive, and should be supplemented by observations for later years. Arrangements were made for a continuation of this census in 1914, but delay in the passage of the appropriation bill and lack of authority to incur liabilities in the absence of appropriation caused the abandonment of the work, much to the regret of the Bureau.

In the latter part of April, 1913, there was begun under the joint auspices of the Bureau of Fisheries and the Association of Audubon Societies a biological survey of Forrester Island, which lies off the coast of Alaska near the southern boundary of the Territory. The investigation was in charge of Dr. Harold Heath, and was continued until August 15. Forrester Island is a Government reservation under the control of the Forest Service, with a warden detailed from the Biological Survey. The warden has power to issue or refuse fishing permits, to enforce the fishing regulations, and to rid the islands of objectionable characters. The number of permits last season was

limited to approximately 300, and the number of power boats to 25. The fishery problem of the island, however, is the competition between the power boat and the rowboat fishermen, the latter being the native Indians, who are at a great disadvantage against the more efficient equipment of the white men. Some lawlessness on the part of the power-boat men, moreover, and dissatisfaction with the warden, complicated the situation, creating hardship to the natives, and generally unsatisfactory, even unsafe, conditions. Regarding the power boat and the hand trollers as irreconcilable elements under existing conditions, the investigator recommends the elimination of the power boats, in the interests of the greatest good to the greatest number.

Attention was given to all of the most important fishes of the locality, of which the king salmon is chief. Since copepods constitute the principal or only diet of the sand lance, black cod, and herring, which in turn are food of the king salmon, it is considered obvious that the migration of copepods is one of the most important unsolved problems connected with the fisheries of Alaska. As this migration is far more definite, clean-cut, and free from modifying influences in the region of Forrester Island than elsewhere, it is strongly recommended that thorough and exact study of this subject be made.

The magnitude of the fisheries of Alaska and the vast potential supplies of aquatic products which are involved in the conservation of the fishery resources merit the expenditure of much larger sums than have as yet been provided. The weighty responsibility imposed on the Bureau in connection with this industry makes it the urgent duty of Congress to grant the necessary personnel and other facilities.

A full account of the extent and condition of the Alaskan fisheries has been published in a special report. It may be noted here that in 1913 this industry gave employment to upward of 21,700 persons, including over 4,000 natives; the investment in fishing property exceeded \$37,000,000, of which \$34,953,000 represented the salmon industry; and the products were valued at about \$15,740,000. The yield of salmon aggregated 59,915,000 fish, from which there were prepared 3,739,000 cases of canned fish, valued at \$13,531,000, and miscellaneous products, valued at \$917,000. Fewer canneries were in operation than in 1912, and there was a decrease in the salmon yield and in the canned output.

Five private salmon hatcheries were operated in Alaska in 1913, and these liberated 77,997,000 fry of the red salmon. This output earned for canners tax exemptions on canned fish aggregating \$31,197 in the fiscal year ending June 30, 1913.

MISCELLANEOUS AFFAIRS AND RELATIONS.

NEW ESTABLISHMENTS.

A site has been selected for the new fish-cultural station in Utah at Springville, Utah County, and steps have been taken looking to the acquisition of the property.

Preliminary inquiries have been made regarding possible sites for the new fish-cultural station authorized for Rhode Island. The State legislature at its last session passed an act giving the United States Commissioner of Fisheries and his duly authorized agents the right to conduct all needed operations in connection with the hatchery.

Title to the property required for the new hatchery in Wyoming has finally been secured, and construction work will soon be begun. By deeds dated April 17, 1914, 40 acres of land and the required water rights have been secured at a cost of \$800 and \$1,200, respectively. The site is $3\frac{1}{2}$ miles north of Saratoga, in Carbon County, on the line of the Saratoga & Encampment Railway, which connects with the Union Pacific at Walcott. Water is to be obtained by piping from Lake Creek Lake and a flow of about 1,000 gallons a minute is assured.

After the most searching investigation extending over a number of years and participated in by various officials of the Bureau, the vicinity of Key West, Fla., has been determined on as the best location for the marine biological laboratory already authorized by Congress, and a site has been selected. Legislation was, however, necessary to acquire the property by direct donation, and an item to this end is contained in the sundry civil appropriation act for 1915.

At the Louisville, Ky., station two pump houses have been completed and equipped with electrically driven pumps with a capacity of 600 to 900 gallons each per minute. The pump houses are 18 feet square, are of frame on a concrete base, and cost \$2,800. A steel storage tank and tower holding 25,000 gallons has been erected. Two stock ponds have been finished, three more are under construction, pipe connections are made, the grounds have been improved, and roadways and paths have been constructed. The appropriation has been exhausted, and \$30,000 will be required to complete the station in accordance with plans.

At the Orangeburg, S. C., station a superintendent's residence 33 by 36 feet was erected by day's labor at a cost of \$6,068.34. It is a two-story frame structure on a concrete foundation, containing 7 rooms and bath, and with cellar and attic rooms. A frame workshop, containing office and storeroom, has been built. For the partial development of the station six brood ponds were partly finished, the main drains were laid, and a concrete outlet was built. The original appropriation has been entirely expended, and \$25,000 additional will be needed to complete the station.

PACIFIC COAST OFFICE.

The activities of the Bureau on the Pacific coast are extensive and diverse, and are yearly becoming more important. It has therefore been decided to establish a branch office in Seattle in order that closer relations may hereafter be maintained with the fishery interests with which the Bureau has to deal. It is proposed to assign an experienced assistant to take charge, and to make the office a center for collecting and disseminating information regarding all fishery matters of interest to the Pacific States and Alaska. The fishery, fish-cultural, scientific, and general administrative work of the Bureau in that region will have headquarters here, and increased economy and efficiency should result.

ALEUTIAN ISLANDS RESERVATION.

Under the authority conferred by the Executive Order of March 3, 1913, creating the Aleutian Islands Reservation, the Secretary of Commerce and the Secretary of Agriculture jointly issued regulations

for the administration of the reservation, effective March 15, 1914. The regulations are as follows:

1. In compliance with existing laws and to carry out the objects of the Executive Order establishing the reservation, all matters relating to wild birds and game, and the propagation of reindeer and fur-bearing animals will be under the immediate jurisdiction of the Department of Agriculture; all matters pertaining specifically to the fisheries and all aquatic life, and to the killing of fur-bearing animals, will be under the immediate jurisdiction of the Department of Commerce; and all matters other than those specifically mentioned above will be under the joint jurisdiction of the Departments of Agriculture and Commerce.

2. Persons residing within the limits of the reservation on March 3, 1913, will be permitted to continue to so reside, and to carry on any lawful business not interfering with the purposes of the reservation.

3. Residents of the reservation desiring to engage in commercial fishing, or the hunting trapping, or propagation of fur-bearing animals or game animals, must first secure a permit to do so.

4. Anyone desiring to enter the reservation for the purpose of fishing, hunting, trapping or propagating fur-bearing animals or game animals, or engaging in commercial fishing, salmon canning, salmon salting, or otherwise curing or utilizing fish or other aquatic products, or for the purpose of engaging in any lawful business, must first obtain a permit to do so.

5. Whenever, in the propagation of fur-bearing animals, it shall be found to be necessary to kill such of these animals as interfere with the work of the Department of Agriculture in this behalf, they may be killed under the supervision of said department, and no permit will be required therefor.

6. *Fishery permits.*—Application for permission to engage in fishing or fishery operations should give full information on the following points: Name and permanent address of the person or company desiring the permit; character of business proposed, whether fishing, canning, salting, or otherwise curing fish or other aquatic products; character and extent of proposed plant and its location; method and extent of the fishing proposed, place or places where fishing is to be carried on, and when active operations are to begin.

7. *Trapping and hunting permits.*—Applications for permission to engage in trapping, hunting or propagating fur-bearing animals or game animals should give the name of the person desiring the permit and the island or islands on which it is proposed to operate. At present no permits will be issued for trapping or hunting fur-bearing animals except to natives of the reservation.

8. *Permits to ship live foxes from the reservation.*—For the present no permits will be issued for capture and shipment of live foxes from the reservation, except domestic stock from established fox farms.

9. Permits to enter the reservation for the purpose of engaging in any business will be granted only when the department concerned is convinced that, by so doing, the objects for which the reservation was established will not be endangered thereby.

10. *Collecting permits.*—Permits to enter the reservation for the purpose of collecting birds, mammals, or other natural-history specimens for scientific purposes will be granted only to properly accredited representatives of the United States Government or agents of public museums.

11. *Reindeer and caribou.*—The killing of reindeer and caribou on any of the islands of the reservation is hereby prohibited except under special permit.

MAINE LOBSTER CONFERENCE.

In the lobster-cultural work of the Bureau on the coast of Maine there has grown up a practice which, on economic grounds, can hardly be defended. This has comprised the purchase of egg-bearing lobsters from fishermen and dealers at market prices and the release of the lobsters in the open sea after their eggs had been stripped from them. The limited funds of the Bureau have thus been diverted from the real work of lobster culture and have to a very great extent been wasted, for lobsters whose eggs have been saved may very properly enter into the trade; as a matter of fact, a large part of those released are subsequently caught and resold by the fishermen.

After full consideration it was decided to discontinue this practice and to make arrangements for utilizing the lobsters which had served their purpose in nature. A conference with the State officials having developed the fact that there was no law or regulation which prevented the sale of lobsters whose eggs had been stripped off, it was determined to make an exchange of such lobsters for egg-bearing lobsters of equal value. This means a saving of many thousand dollars annually, and will permit a noteworthy increase in lobster hatching.

The purposes of the Bureau were misunderstood in Maine, and many inquiries, complaints, and criticisms were received. The outcome was a conference held on January 23, 1914, at the office of the Commissioner of Fisheries, for the purpose of announcing the policy of the Bureau in this matter and its general attitude toward the lobster industry, and of making known the views of the State Commissioner of Sea and Shore Fisheries, the lobster fishermen, and the lobster dealers, all of whom were represented at the conference. The Governor of Maine and the entire State delegation in Congress were also present. The new policy of the Bureau was unanimously approved. A formal minute, showing the manner in which collections of egg-bearing lobsters would hereafter be made by the Bureau, was adopted in behalf of the lobster dealers with the approval of the State authorities, as follows: In order to assist in maintaining the lobster supply on the coast of Maine, and to cooperate with the Federal Government and the State of Maine in the work of artificial propagation, the lobster dealers and owners of lobster pounds will hereafter furnish to agents of the Bureau of Fisheries as heretofore any seed lobsters which may come into their possession, weighing the same and computing their value at the current market prices, and taking in exchange therefor lobsters which have been stripped of their eggs by the Bureau of Fisheries, due allowance being made for difference in price.

PUBLICATIONS.

The most important feature in connection with the publications of the Bureau during the past year has been the increased number and growing popularity of the recently instituted "Economic Circulars." These brief papers, sometimes giving advance information on work under way, may often have a complete and definite purpose of their own. Thus, of Economic Circular No. 11, "Canned salmon: Cheaper than meats and why, including fifty tested recipes," 25,000 copies were printed for distribution by the Bureau to encourage the utilization of salmon and an extra edition of 10,000 was printed on private orders. Economic Circular No. 12, "Sea mussels: What they are and how to cook them, including eighteen recipes," was used to similar purpose in a publicity campaign to establish a market for a new sea food.

Reports on special work of the Bureau and technical papers on biological subjects have been published as usual, the former in the regular series of papers associated with the annual report of the Commissioner and the latter as parts of the annual Bulletin of the

Bureau of Fisheries. A complete list of all documents issued during the year is as follows:

- Observations on fish scales. By T. D. A. Cockerell. Bulletin, vol. **xxxii**, 1912, p. 117-174, pl. **xxxii-xi**, 52 text fig.
- Fishery and fur industries of Alaska in 1912. By Barton Warren Evermann. 123 p.
- The mussels of the Cumberland River and its tributaries. By Charles B. Wilson and H. Walton Clark. 63 p.
- Report of the Commissioner of Fisheries for the fiscal year ended June 30, 1913. 78 p.
- Fishes and fishing in Sunapee Lake. By William Converse Kendall. 96 p.
- A new method for the determination of the food value of proteins, with application to *Cynoscion regalis*. By George F. White and Adrian Thomas. Bulletin, vol. **xxxii**, 1912, p. 175-182, 2 text fig.
- Properties of fish and vegetable oil mixtures. By George F. White and Adrian Thomas. Bulletin, vol. **xxxii**, 1912, p. 183-198, 9 text fig.
- The effect of water-gas tar on oysters. By Philip H. Mitchell. Bulletin, vol. **xxxii**, 1912, p. 199-206.
- The oxygen requirements of shellfish. By Philip H. Mitchell. Bulletin, vol. **xxxii**, 1912, p. 207-222, text fig.
- The Anthozoa of the Woods Hole region. By Charles W. Hargitt. Bulletin, vol. **xxxii**, 1912, p. 223-254, pl. **xli-xliv**.
- The Cephalopoda of the Hawaiian Islands. By S. Stillman Berry. Bulletin, vol. **xxxii**, 1912, p. 255-362, pl. **xlvi-lv**.
- Carcinoma of the thyroid in the salmonoid fishes. By Harvey R. Gaylord and Millard C. Marsh. Bulletin, vol. **xxxii**, 1912, p. 363-524, pl. **lvi-cx**, 53 text fig.

ECONOMIC CIRCULARS.

- The mussel fisheries of Caddo Lake and the Cypress and Sulphur Rivers of Texas and Louisiana. 10 p.
- Opportunity for a new sea scallop fishery off the Middle Atlantic coast. 5 p.
- The offshore fishing grounds of North Carolina. 6 p.
- Mussel streams of eastern Oklahoma. 4 p.
- Mussel resources in Missouri. 6 p.
- Canned salmon: Cheaper than meats and why, including fifty tested recipes. 11 p.
- Sea mussels: What they are and how to cook them, with eighteen recipes. 5 p., 1 text fig.

APPROPRIATIONS.

The appropriations for the Bureau for the fiscal year 1914 aggregated \$1,047,180, as follows:

| | |
|--|-----------|
| Salaries..... | \$391,180 |
| Miscellaneous expenses: | |
| Administration..... | 10,000 |
| Propagation of food fishes..... | 335,000 |
| Inquiry respecting food fishes..... | 40,000 |
| Statistical inquiry..... | 7,500 |
| Maintenance of vessels..... | 60,000 |
| Protecting the sponge fisheries..... | 3,500 |
| Beam-trawl investigation..... | 5,000 |
| Alaska fisheries service..... | 75,000 |
| New distribution cars..... | 30,000 |
| Steamer <i>Albatross</i> repairs..... | 40,000 |
| Establishment of fish-cultural stations: | |
| Utah..... | 25,000 |
| Rhode Island..... | 25,000 |

A full report of expenditures authorized by these appropriations will be made to Congress as required by law.

FISHERY MATTERS BEFORE CONGRESS.

In the act making appropriations for the support of the Bureau for the fiscal year 1915, a very important limitation was placed on the lump sum of money provided for the propagation of food fishes. The limiting clause, which will conduce to economy and increased efficiency of the fish-cultural work and will greatly strengthen the position of the Bureau in its cooperative relations with the States, is as follows:

No part of the foregoing amount shall be expended for hatching or planting fish or eggs in any State in which, in the judgment of the Secretary of Commerce, there are not adequate laws for the protection of the fishes, nor in any State in which the United States Commissioner of Fisheries and his duly authorized agents are not accorded full and free right to conduct fish-cultural operations, and all fishing and other operations necessary therefor, in such manner and at such times as is considered necessary and proper by said Commissioner or his agents.

During the fiscal year 82 bills were introduced in the House of Representatives providing for the establishment of fish-cultural and biological stations and 18 similar bills were presented in the Senate. Of the latter 9 passed that body. In addition, an omnibus bill providing for the establishment of 15 fish-cultural stations in different States and carrying amounts aggregating nearly \$800,000 was favorably reported by the Committee on the Merchant Marine and Fisheries and placed on the House calendar.

A bill providing for Federal control over fishes that do not remain within the waters of any State or Territory was introduced in the House, and hearings thereon were held by the Committee on the Merchant Marine and Fisheries. The bill affects primarily the migratory fishes of the coastal, Great Lakes, and interstate waters, and vests the power to regulate their capture in the Department of Commerce. This bill, if passed, will mark a new departure in Federal fishery legislation.

A bill to regulate the taking of sponges in the waters of the Gulf of Mexico and the Straits of Florida outside of State jurisdiction passed the Senate but did not come up in the House during the fiscal year. It, however, passed the House in August, and was signed by the President and became effective August 15, 1914. This law corrects defects in previous legislation and was advocated by the Bureau.

In March, 1914, the Senate passed a bill to give effect to the treaty of April 13, 1908, providing for joint international regulations for the fisheries in the contiguous waters of the United States and Canada. A favorable report was made on the measure by the Committee on Foreign Affairs of the House, but no final action was taken. Inasmuch as Canada, in 1910, adopted the regulations made in accordance with the treaty, the failure of the United States to comply with the treaty stipulations has caused much embarrassment, and there is a possibility that Canada will take steps to abrogate the treaty. Should this be done, certain fisheries that can not get adequate protection except through international agreement will suffer.

A bill authorizing the Secretary of Commerce, through the Coast and Geodetic Survey and the Bureau of Fisheries, to make a survey of oyster beds in the State of Florida, passed the Senate, and an item for this work, under the direction of the Bureau of Fisheries, was incorporated in the sundry civil appropriation act for 1915.

A bill was passed granting the State of California authority to construct a State road through the reservation at the Baird, Cal., fisheries station, and right of way for a boulevard 120 feet wide through the Louisville, Ky., fisheries station was granted by a clause in the sundry civil appropriation act for 1915.

A joint resolution giving authority to take not exceeding 30 specimens of fur seals on the Pribilof Islands for the National Museum passed the Senate and was recommended by the House Committee on the Merchant Marine and Fisheries, but failed of passage in the House.

RECOMMENDATIONS.

The recommendations in the report of the Bureau for the previous fiscal year regarding (1) a lobster-rearing plant for the New England coast, (2) a fishery research laboratory for the Pacific coast, (3) increased men and vessels for the Alaskan service, (4) relief from the incongruous duties imposed by law in connection with the fur-bearing animals of Alaska, (5) the establishment of a fishery experiment station, (6) the creation of the position of fish pathologist, (7) the granting of increased aid to the shellfish industries, and (8) a new office building for the Bureau in Washington, are reaffirmed.

Special emphasis should be laid on the urgent need for a building which will combine adequate office accommodations with laboratories and a national aquarium. The building occupied by the Bureau was built in 1856 for purposes entirely foreign to the uses to which it is being put. The lack of every modern convenience, lack of office and storage space, and lack of laboratory facilities have frequently been dwelt on. The surgeon of the Public-Health Service who inspected the building in June, 1914, in accordance with an Executive Order, reported on the congestion, and criticized the use of lockers and unventilated closets for clothing and cleaning material, and other antiquated, unhealthful conditions which can not be ameliorated in such crowded space. The building is surrounded on two sides by storage sheds whose tin roofs reflect and radiate heat to such a degree that, notwithstanding the constant use of electric fans, the temperature in some rooms is often such that no one should be required to work in them. Several cases of prostration have occurred. These sheds are very unsightly and a blemish to The Mall, but are necessary for storage and shop purposes.

Respectfully,

H. M. SMITH,
Commissioner.

To Hon. WILLIAM C. REDFIELD,
Secretary of Commerce.

REPORT
OF THE
COMMISSIONER OF LIGHTHOUSES

471

REPORT

OF THE

COMMISSIONER OF LIGHTHOUSES.

DEPARTMENT OF COMMERCE,
BUREAU OF LIGHTHOUSES,
Washington, September 15, 1914.

SIR: The following report is submitted of the operations of the Lighthouse Service for the fiscal year ended June 30, 1914.

ORGANIZATION OF THE LIGHTHOUSE SERVICE.

The reorganization of the Lighthouse Service under the provisions of the act of Congress approved June 17, 1910, was entirely completed during the early part of the fiscal year 1913, and has continued to operate satisfactorily during the fiscal year 1914. All of the lighthouse districts, with the exception of the three river districts, are now in charge of civilian inspectors. It is believed that the efficiency of the Service has been increased by the reorganization and that the work is more economically performed, especial attention being invited to the fact that up to July 1, 1914, there has been an increase of 2,485, or more than 21 per cent, in the number of aids maintained over the corresponding number on July 1, 1910, while the total general appropriations for the support of the Service for the fiscal year 1915 are about \$320,000 less than those for the fiscal year 1911.

The general organization of the Lighthouse Service remains the same as described in the annual report for 1913.

PERSONNEL.

The table following gives the number of employees of the Lighthouse Service at the end of the fiscal year and a comparison of the totals with those for the previous fiscal year.

EMPLOYEES IN THE LIGHTHOUSE SERVICE ON JUNE 30, 1914.

| District. | Executive officers, inspectors, engineering force, and draftsmen. | Clerks, messengers, janitors, and office laborers. | Depot keepers and assistants. | Light keepers and assistants. | Laborers in charge of lights (appropriation "Salaries, keepers of lighthouses"). | Laborers in charge of port lights (appropriation "General expenses"). | Custodians of reservations. | Officers and crews on tenders and light vessels. | Field force for construction and repair (registered). | Field force for construction and repair (unregistered). | Total. |
|------------------|---|--|-------------------------------|-------------------------------|--|---|-----------------------------|--|---|---|--------|
| Bureau..... | 19 | 26 | | | | | | | | | 45 |
| First..... | 2 | 6 | 1 | 114 | 3 | | | 65 | 9 | 12 | 212 |
| Second..... | 4 | 7 | 3 | 79 | 11 | | | 198 | 1 | 7 | 310 |
| Third..... | 10 | 28 | 10 | 178 | 33 | 56 | 2 | 263 | 129 | 22 | 731 |
| Fourth..... | 3 | 5 | 1 | 54 | 7 | 12 | | 23 | 8 | 14 | 133 |
| Fifth..... | 10 | 9 | 7 | 177 | 87 | 23 | 2 | 229 | 21 | 9 | 574 |
| Sixth..... | 3 | 7 | 4 | 61 | 6 | 24 | | 114 | 3 | 10 | 232 |
| Seventh..... | 2 | 3 | 1 | 48 | | | | 52 | 4 | 6 | 116 |
| Eighth..... | 4 | 6 | 4 | 107 | 21 | 34 | | 91 | 5 | 16 | 288 |
| Ninth..... | 1 | 4 | 2 | 34 | 4 | | | 22 | 2 | | 69 |
| Tenth..... | 4 | 5 | 3 | 68 | 1 | | 1 | 27 | 5 | | 138 |
| Eleventh..... | 5 | 6 | 6 | 161 | 12 | 2 | 2 | 100 | 20 | 52 | 366 |
| Twelfth..... | 7 | 6 | 4 | 160 | 2 | 2 | | 90 | 2 | 25 | 298 |
| Thirteenth..... | 1 | 2 | | | | 323 | | 18 | | | 344 |
| Fourteenth..... | 1 | 2 | | | | 540 | | | | | 543 |
| Fifteenth..... | 1 | 2 | | | | 425 | | 19 | | | 447 |
| Sixteenth..... | 4 | 4 | 1 | 26 | | 12 | | 27 | 3 | 2 | 79 |
| Seventeenth..... | 4 | 6 | 2 | 77 | 15 | 106 | | 107 | 6 | 4 | 327 |
| Eighteenth..... | 4 | 6 | 6 | 110 | 6 | 4 | | 90 | 9 | 5 | 240 |
| Nineteenth..... | 4 | 3 | 1 | 31 | 3 | | | 28 | | | 70 |
| Total, 1914..... | 93 | 143 | 56 | 1,485 | 211 | 1,563 | 13 | 1,563 | 227 | 208 | 5,562 |
| Total, 1913..... | 86 | 146 | 57 | 1,500 | 207 | 1,575 | 10 | 1,509 | 234 | 212 | 5,536 |
| Increase..... | 7 | | | | 4 | | 3 | 54 | | | 26 |
| Decrease..... | | 3 | 1 | 15 | | 12 | | | 7 | 4 | |

AIDS TO NAVIGATION.

During the fiscal year ended June 30, 1914, there was a net increase of 677 in the total number of aids to navigation maintained by the Lighthouse Service, including 59 lights above the order of minor lights, 1 fog signal, 2 submarine bells, 270 daymarks, 65 lighted buoys, 157 unlighted buoys, and 88 minor lights.

Fixed lights were changed to flashing or occulting at 67 stations. The illuminant of 37 lights was changed to incandescent oil vapor, the illuminant of 25 lights was changed to acetylene, and the illuminant of 48 lights was changed to oil gas. No new light vessels were established during the year, but 1 light-vessel station was discontinued, the latter being due to the loss of Buffalo Light Vessel during the great storm of November 10, 1913. On June 30, 1914, there were maintained by the Lighthouse Service, 14,198 aids to navigation, including 5,004 lights of all classes, and 567 fog signals, of which 48 are submarine signals. It is believed that the systematic methods of improvement and the use of modern apparatus in increasing the number and brilliancy of aids have been of value to the safety of commerce. Particular attention is invited to the fact that incandescent oil vapor is now used as the illuminant of 268 lights, embracing practically all the principal seacoast lights in the service.

The table following gives a summary of the aids to navigation, under each class, established and discontinued during the fiscal year, and also the net increase, and the number in commission at the end of the fiscal years 1913 and 1914:

| Class. | 1914 | | | Total June 30— | |
|---------------------------------------|-------------------|--------------------|----------------|-------------------|---------------|
| | Estab- lished. | Discon- tinued. | Increase. | 1913 ^a | 1914 |
| Lighted aids: | | | | | |
| Lights (other than minor lights)..... | 81 | 24 | 59 | 1,531 | 1,590 |
| Minor lights..... | 202 | 112 | 88 | 2,703 | 2,791 |
| Light-vessel stations..... | | 1 | ^b 1 | 53 | 52 |
| Gas buoys..... | 92 | 27 | 65 | 388 | 453 |
| Float lights..... | 20 | 3 | 17 | 101 | 118 |
| Total..... | 395 | 167 | 228 | 4,776 | 5,004 |
| Unlighted aids: | | | | | |
| Fog signals..... | 4 | 3 | 1 | 518 | 519 |
| Submarine signals..... | 3 | 1 | 2 | 46 | 48 |
| Whistling buoys, unlighted..... | 7 | 5 | 2 | 84 | 86 |
| Bell buoys, unlighted..... | 30 | 13 | 17 | 216 | 233 |
| Other buoys..... | 453 | 296 | 157 | 6,173 | 6,330 |
| Day beacons..... | 346 | 76 | 270 | 1,708 | 1,978 |
| Total..... | 843 | 394 | 449 | 8,745 | 9,194 |
| Grand total..... | 1,238 | 561 | 677 | 13,521 | 14,198 |

^a Differences from statistics published in 1913 report are due to minor discrepancies in previous count.

^b Decrease.

The following are some of the more important aids which have been established or materially improved during the past fiscal year:

Complete new and improved systems of lighted aids were established in Baltimore Harbor, Md.; North Channel, Boston Harbor, Mass.; and St. Marys River, Mich.

First-order lights changed to flashing or occulting: Cape Blanco, Oreg.; Cape Lookout, N. C.; Shinnecock Bay, N. Y.; North Head, Wash.; Cape Flattery, Wash.

Special improvements at Capes Hatteras and Lookout, N. C., included an increase in intensity and speeding up of the lens at Cape Hatteras, and the introduction of a 3-mantle oil-vapor lamp with occulting screens to produce a more effective characteristic at Cape Lookout.

Horn fog signal established: Whatcom Waterway, Wash.

Fog bells established: Aunt Phoebe Rock, N. Y.; Fiddlers Reach, Me.; Sandy Point Breakwater, Conn.

Submarine bells added to existing gas and whistling buoys: Point Judith, R. I.; Manana Island, Me.; St. Johns Entrance, Fla.

Important gas buoys established: McCries Shoal, N. J. (whistle); Little Gull Bank, Md. (whistle); Cape Romain, S. C. (whistle); Charleston, S. C. (bell); Biscayne Shoal, Fla. (bell); Point Delgada, Cal. (whistle); Duxbury Reef, Cal. (whistle); Joe Flogger Shoal, Del. (bell); Blackfish Bank, Va. (whistle); Boulder Reef, Mich. (whistle); Molasses Reef, Fla.; Cortes Bank, Cal. (whistle); Cape San Blas, Fla. (bell); Point Partridge, Wash. (bell); Port Harford, Cal. (whistle); Port Inglis, Fla. (whistle).

Systems of minor aids and buoyage extensively rearranged or improved in important localities: Kennebec River, Me.; Cohasset Harbor, Mass.; New Bedford Harbor, Mass.; Providence River, R. I.; Lake Champlain, N. Y. and Vt.; Elizabeth River, Va.; Inland Waterway, S. C., Ga., and Fla.; Charleston Harbor, S. C.; Savannah River, Ga.; St. Simon Sound, Ga.; Charlotte Harbor, Fla.; Anclote River,

Fla.; Sturgeon Bay, Wis.; Prince of Wales Island, Alaska; Kuhio Bay, Hawaii.

Flashing gas lights established: Acetylene—Caines Head, Windy Bay, Pilot Rock, Woody Island, Point Elrington, Smith Island, Cape Spencer, Cape St. Elias, and Point Ellis, Alaska; Sandy Point Breakwater, Conn.; Great Kills, N. Y.; Newark Bay, N. Y. and N. J. (4 lights); Fishing Point, Va.; Fort McHenry, Md.; Cape Fear River, N. C. (2 lights); Eastern Triangle, Fla.; Galveston Bay, Tex.; Ludington North Breakwater, Mich.; Kewaunee, Wis.; Port Wing, Wis.; Redding Rock, Cal. Oil gas—Recors Point, Mich.; St. Marys River, Mich. (45 lights).

The fiscal year was marked by an unusual amount of storm damage, the greatest loss occurring in the extremely severe storm of November 8, 9, and 10, 1913, on the Lakes, during which light vessel *No. 82* on station in Lake Erie about 13 miles southwest of Buffalo, N. Y., was lost with her entire crew of six men. This is the second instance in the history of the Lighthouse Service in which a light vessel has foundered on station, the previous occurrence being on August 23-24, 1893, when light vessel *No. 37* was lost on Five-Fathom Bank, N. J., with four out of six men on board. Search was immediately instituted for the lost vessel, but the almost continuous heavy weather which prevailed from the date of the storm to the close of navigation in December prevented favorable results. In the meantime sufficient wreckage, including both small boats, doors, portion of vessel's rail, etc., drifted ashore as to preclude any hope for the safety of the crew. The search was resumed with the cooperation of the United States Lake Survey, using a wire drag, as soon as weather and ice conditions permitted in the spring, and on May 9, 1914, the wreck was located about 2 miles northeast of her station in 63 feet of water. The hull was found apparently intact, though the interior appeared badly damaged. No bodies were found. Bids were invited for raising the vessel and delivering her afloat in Buffalo Harbor, and a contract was let as soon as practicable. The work was in progress at the close of the fiscal year.

In addition to the loss of the vessel, valued at \$50,000, damage amounting to about \$15,000 was done to various light stations and vessels in the Lake districts by the same storm.

Other noteworthy storms were the hurricane of September 2 and 3, 1913, in the North Carolina Sounds, which destroyed about 20 post lights and damaged other lighthouse property at a total loss of about \$6,000, and the storm of November 29, 1913, on the North Pacific coast, which damaged lighthouse property to the extent of about \$11,000. No lives of persons in the Lighthouse Service were lost in either of these storms.

In accordance with the plan outlined in the annual report for 1913 for distinguishing light-vessel stations, international code-signal letters have been assigned to the various stations.

A further improvement in the standard form of Notices to Mariners was effected by printing, in the back of each weekly notice, a list of corrections affecting the light lists, arranged in the tabular form of the lists, for greater convenience in correcting the lists by clipping and pasting.

Amendments to the Regulations for Lighting Bridges were approved by the Secretary on April 29, 1914, and steps were taken at the close

of the fiscal year for the printing of revised regulations embodying such amendments, which have the effect of making the regulations more flexible, conforming to new conditions which have arisen.

To insure more complete uniformity in the buoyage of the Service, arrangements were made for reporting spare gas buoys at regular intervals, as well as statistics showing the number, locality, and reasons, in the cases of buoys not relieved each year. Instructions regarding the painting of striped buoys were also under consideration at the close of the fiscal year.

ALASKA.

The total number of aids to navigation in Alaska, including lights, fog signals, buoys, and daymarks, in commission at the close of the fiscal year ended June 30, 1914, was 319, including 108 lights, representing an increase of 71 lights since June 30, 1910, or nearly 200 per cent. The following table, which gives the total number of aids to navigation on June 30 of each year named, illustrates the progress in establishing aids in the Territory:

| Aids. | 1910 | 1911 | 1912 | 1913 | 1914 |
|------------------|------|------|------|------|------|
| Lights..... | 37 | 71 | 85 | 93 | 106 |
| Fog signals..... | 9 | 10 | 10 | 10 | 10 |
| Buoys..... | 84 | 105 | 132 | 136 | 157 |
| Daymarks..... | 30 | 29 | 38 | 40 | 44 |
| Total..... | 160 | 215 | 265 | 279 | 319 |

The act of October 22, 1913, made an appropriation of \$115,000 for a light and fog-signal station at or near Cape St. Elias. On account of the late date in the season, no work was practicable until the season of 1914. A temporary light was established at Cape St. Elias on June 18, 1914, and preliminary survey made for the permanent station.

An estimate for an appropriation of \$325,000 for a new tender to replace the *Armeria* was included in the Department's estimates for the fiscal year 1915, which also included an item for the establishment of aids to navigation and the improvement of existing aids in Alaska, in the sum of \$60,000. An appropriation for the latter object was made by the sundry civil act approved August 1, 1914, after the close of the fiscal year, and plans had already been approved for the establishment of a number of lights under this appropriation. No appropriation has as yet been made for the tender, which is urgently needed to enable the work of the Lighthouse Service in Alaska to be maintained at an efficient standard, and an estimate of \$250,000 is submitted for this object.

GUANTANAMO, SAMOA, AND GUAM.

The aids to navigation in the outlying United States territory at Guantanamo Bay, Cuba; the American Samoan Islands; and the island of Guam are maintained under the supervision of the naval commandants by means of allotments made from the appropriations for the Lighthouse Service. Reports have been received from naval officers in local charge, indicating that the aids have been properly

maintained, at an approximate annual expense as follows: Guantano, \$2,540; Samoa, \$1,220; Guam, \$232.

On account of the increasing amount of trans-Pacific commerce between the United States and Australia, measures were taken during the fiscal year for the improvement of the Samoan lights, and fourth-order lenses were substituted for lens lanterns at Aunuu Island, Breaker Point, and Steps Point Range, increasing the candle-power about threefold at each place.

ADMINISTRATION METHODS AND ECONOMIES.

A conference of lighthouse inspectors, authorized by the Secretary of Commerce, was held for the first time in the history of the Service during February, 1914. A detailed synopsis of subjects for discussion, under the general heads of aids to navigation, administrative methods, construction work, apparatus and equipment, vessels, and similar topics was prepared and distributed in advance. The proceedings were entirely informal, and general minutes embodying the results of the discussion were subsequently sent to the various inspectors. The inspectors were received by the Secretary, and a visit to the general depot closed the conference. The results are believed to be of great value in effecting a closer degree of cooperation and efficiency, as well as affording inspectors an opportunity for interchange of ideas and methods.

During the fiscal year the office of the Bureau was removed to the Commerce Building, in which most of the various bureaus and services of the Department, as well as the Secretary's Office, are now located. This has been of benefit in increasing the prompt dispatch of public business.

The office of the twelfth lighthouse district, embracing Lake Michigan and adjacent waters, was moved from Chicago, Ill., to Milwaukee, Wis., on September 17, 1913, with the object of having the office in a more central location in the district and in the same port as one of the depots.

Systematic inspections were continued during the fiscal year in the various lighthouse districts by the general inspector, examiner, and officers of the Bureau. The increasing value of this work in maintaining the Service at a high standard is shown in the good results accomplished.

A statement regarding the standard method of cost keeping with a general summary of results is given under a separate head. Arrangements were also made for furnishing the Department at regular intervals a report of costs under general heads, in a uniform manner for the entire Department. Revised instructions for cost keeping, containing desirable modifications as a result of the experience gained with the system, were issued toward the close of the fiscal year.

An inquiry was made as to the most desirable methods of preparing vouchers, either in the office of the inspector or by the firms supplying the articles of purchase, and suitable instructions were issued the various districts.

A revision was made of the number of permanent foremen, mechanics, and other employees of like character in the field work of the Service in order to group all such persons under the appropriation "Salaries, Lighthouse Service," while temporary employees perform-

ing similar duties are classed under the appropriation "General expenses, Lighthouse Service," and employed only a portion of the year.

Revised instructions relative to making requisitions for office furniture, equipment, and supplies, in conformity with a revised manual issued by the Department on the subject, were issued during the year.

A general examination was made of library books furnished isolated stations and vessels, and instructions were issued for general improvement of them, including books for children where desirable.

An inquiry was made in reference to educational conditions for children of lighthouse keepers at such stations as are not readily accessible to ordinary school facilities, and arrangements made for systematic transfer of such keepers and consultation with local educational authorities when practicable.

A standard method of handling requests of lighthouse keepers for transfers was outlined, in order to insure equitable treatment of such employees and uniformity in the matter.

Permission was obtained from the Civil Service Commission for transferring employees from trades or mechanical positions to that of watchman in the Lighthouse Service under suitable restrictions as to eligibility.

Revised regulations governing leaves of absence were issued by the Department and distributed to the various districts for the information and guidance of employees.

The Department also issued regulations governing travel, which were distributed to the district offices and have proven satisfactory in operation.

New regulations governing the payment of medical and surgical, also of burial, expenses for nonstatutory employees were put into effect during the fiscal year. These provide for a maximum payment of \$100 for each object, under proper safeguards and restrictions.

Commutation of subsistence on lighthouse vessels, authorized by the act of August 24, 1912, and inaugurated last year, was gradually extended during the fiscal year, and at the close thereof all lighthouse vessels, including light vessels and tenders, were operated under this system, with excellent results. In order to provide against any possible shortage in food supplies, reserve provisions consisting of meat and pilot bread in tins were prescribed for isolated vessels and stations in quantities suitable for the various complements and localities, and instructions issued for the proper consumption of such provisions in rotation; also for their replenishment and inspection at stated intervals.

The customary annual inventory of spare property in the various lighthouse districts was continued and issued to all districts, in order to effect an economical exchange of such property by transfer to other districts, where use for the articles might be found advantageous.

Revised instructions governing the sale of condemned property, in accordance with the act of March 4, 1913, were issued. These provide for sales under sealed bids, where desirable, and for more prompt forwarding of the gross receipts, and for the payment of expenses of the sale from such receipts by the disbursing clerk of the Department.

Tentative arrangements were made for the exhibit of the Lighthouse Service at the Panama-Pacific International Exposition, to be

held in San Francisco in 1915. Estimates of expense and lists of articles to be exhibited were prepared, and an allotment of \$4,750 was granted by the governing board from the appropriation made for the Government's exhibit. An examination of records was made to ascertain the nature and number of lighthouse articles of historical interest which might be of value to the exhibit.

Instructions for preparing checks of disbursing agents on the typewriter, and arrangements for obtaining such checks in sheets, were completed for use in such districts where the practice was deemed desirable.

Regulations governing the design and use of official flags for officers of the Department, also for the Commissioner of Lighthouses and the lighthouse inspectors, as well as for the chiefs of other maritime bureaus in the Department, were issued by the Department during the year.

The order of the Postmaster General increasing the limits of weight for mail matter transmitted by parcel post within certain zones to a maximum of 50 pounds was put into effect in the Lighthouse Service and has proven advantageous in shipping many smaller articles of supply.

With a view to avoiding any delay in the business of the Service, a form showing the nature and mailing dates of various routine reports required was prepared and distributed, and in the accomplishment of the same purpose a standard form of follow-up letter to be used in case of delayed replies was also devised.

The publication of the monthly Lighthouse Service Bulletin describing the principal events in the Service of interest and importance to officers and employees was continued throughout the year. The publication of this bulletin was commenced in January, 1912.

The study of the most useful size and arrangement of light and buoy lists was continued, and consideration given to efficient and ready methods of keeping copy for the printer corrected to date, in order to prevent delays in publication. Toward the close of the fiscal year arrangements were made for printing buoy lists in octavo size, which it is believed will extend the usefulness of the publication by providing the information in a more compact form and at lessened cost.

A new edition of the regulations, embodying all changes and amendments made in the former edition of 1911, was in preparation at the close of the fiscal year.

COST-KEEPING SYSTEM AND RESULTS.

A standard method of cost keeping has been continued in effect throughout the fiscal year, and reports have been received from all the districts, in which itemized costs of each office, depot, light and fog signal station, tender, and light vessel are shown separately. The costs of minor lights, daymarks, and lighted and unlighted buoys are shown in groups by various districts, each type of aid to navigation being accounted for separately. In all cases the costs are divided into main headings—maintenance and betterments. The cost of maintenance includes what may be considered fixed charges, such as salaries, rations, fuel, and general expendable supplies. The item of betterments includes repairs, improvements, and

new construction, and is further subdivided to show the cost of labor and materials separately for each principal object.

The costs are based on the actual expenditures during the fiscal year, whether of money or supplies. They are checked with the money accounts by taking into consideration the actual cash expenditures and the difference in the value of supplies on hand at the beginning and at the end of the year. The information from this cost-keeping system is useful in preparing estimates, planning work, effecting economies, and comparing the efficiency of different districts, vessels, light stations, apparatus, methods, etc.

A generalized summary of costs for the fiscal year ended June 30, 1914, follows, as derived from this cost-keeping system. Overhead charges, offices, depots, and tender service are stated as separate features in this summary and are not distributed nor included in the costs of aids to navigation.

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SUMMARY OF COSTS, LIGHTHOUSE SERVICE, FISCAL YEAR ENDED JUNE 30, 1914.

Amounts are stated to nearest even dollar, causing occasional minor discrepancies in totals. Difference from total expenditures reported elsewhere is due to inclusion of Bureau salaries, printing expenses, and adjustment of inventories of articles already in stock.]

TOTAL COSTS OF PRINCIPAL FEATURES.

| Feature. | Maintenance expenses. | | | | Betterment expenses. | | | | Grand total. | Per cent. |
|-----------------------------------|-----------------------|----------|-------------------|----------------------|----------------------|---------------------------|-------------------------|------------|--------------|-----------|
| | Salaries. | Rations. | General supplies. | Incidental expenses. | Total. | Repairs and improvements. | | New works. | | |
| | | | | | | Labor. | Materials and supplies. | | | |
| Administration a..... | \$334,551 | | \$59,572 | \$2,267 | \$396,390 | | | | \$396,390 | 7 |
| Distributive charges b..... | 753,094 | | 440,503 | 14,264 | 1,207,861 | \$158,393 | \$162,753 | \$65,468 | \$386,611 | 30 |
| Aids to navigation c..... | 1,460,334 | 250,330 | 395,598 | 20,241 | 2,126,723 | 268,191 | 747,730 | 547,107 | 1,593,028 | 63 |
| Total..... | 2,548,139 | 444,283 | 895,643 | 36,802 | 3,924,867 | 426,584 | 910,483 | 612,575 | 1,949,642 | 100 |
| TOTAL COSTS OF DETAILED FEATURES. | | | | | | | | | | |
| Offices..... | \$334,551 | | \$81,380 | \$2,267 | \$418,198 | | | | | 7 |
| Depots..... | 142,904 | \$25 | 79,939 | 8,194 | 231,062 | \$37,228 | \$41,588 | \$11,354 | \$90,170 | 5 |
| Tenders: | | | | | | | | | | |
| Large..... | 173,060 | 52,355 | 112,773 | 1,342 | 339,530 | 19,179 | 16,178 | | 32,357 | 6 |
| Medium..... | 384,976 | 125,792 | 202,503 | 3,779 | 717,050 | 96,607 | 96,607 | 34,689 | 227,903 | 16 |
| Small..... | 52,064 | 15,781 | 23,480 | 979 | 92,304 | 8,379 | 8,380 | 19,425 | 36,184 | 2 |
| Total..... | 610,100 | 193,928 | 338,756 | 6,100 | 1,148,884 | 124,165 | 121,165 | 54,114 | 296,444 | 24 |
| Light vessels: | | | | | | | | | | |
| Exposed..... | 104,577 | 39,928 | 45,697 | 1,611 | 251,723 | 21,429 | 21,429 | 2,949 | 45,807 | 5 |
| Moderately exposed..... | 93,324 | 26,917 | 17,197 | 419 | 137,861 | 30,049 | 30,050 | 267 | 60,366 | 8 |
| Relief..... | 41,515 | 11,959 | 14,241 | 265 | 68,986 | 34,666 | 34,666 | | 69,332 | 2 |
| Lakes..... | 37,707 | 11,055 | 7,395 | 2,690 | 58,847 | 5,227 | 5,228 | 111,045 | 122,100 | 3 |
| Total..... | 337,123 | 89,909 | 84,440 | 4,985 | 516,457 | 91,371 | 91,373 | 114,861 | 297,605 | 13 |

[illegible]

a Includes offices, except expenses of publications and general freight accounts.
b Includes depots and tenders; also items excepted above, charged to supplies.
c Includes light vessels, light stations, minor fixed aids, and buoys.

Includes depots and tenders; also items excepted above, charged to supplies.

- Includes light vessels, light stations, minor fixed aids, and buoys.

SUMMARY OF COSTS, LIGHTHOUSE SERVICE, FISCAL YEAR ENDED JUNE 30, 1914—Con.

AVERAGE COSTS OF SELECTED FEATURES.

| Average cost of— | Salaries. | Rations. | Illuminants. | Fuel. | Other supplies. | Incidentals. | Total maintenance. | Repairs and improvements. | Total. |
|--|-----------|----------|--------------|----------|-----------------|--------------|--------------------|---------------------------|----------|
| District office, exclusive of third. | \$12,130 | ..... | ..... | ..... | \$2,069 | \$112 | \$14,311 | ..... | \$14,311 |
| District depot, exclusive of third. | 5,067 | ..... | ..... | ..... | 2,600 | 76 | 7,742 | \$3,924 | 11,666 |
| Large tender, Pacific. | 21,696 | \$5,703 | ..... | \$10,639 | 3,027 | 283 | 41,347 | 2,443 | 43,790 |
| Large tender, Atlantic. | 17,996 | 5,874 | ..... | 8,483 | 3,480 | 82 | 35,915 | 4,172 | 40,086 |
| Medium tender. | 12,726 | 4,164 | ..... | 4,369 | 2,309 | 126 | 23,695 | 6,439 | 30,134 |
| Exposed light vessel. | 8,774 | 2,040 | \$89 | 1,469 | 723 | 106 | 13,204 | 1,951 | 15,155 |
| Moderately exposed light vessel. | 4,435 | 1,282 | 96 | 280 | 394 | 16 | 6,503 | 2,358 | 8,861 |
| Lake light vessel. | 3,142 | 921 | 31 | 311 | 275 | 224 | 4,904 | 871 | 5,775 |
| First-order light stations with powerful fog signals. | 2,343 | 412 | 166 | 439 | 286 | 61 | 3,707 | 622 | 4,329 |
| First-order light stations without fog signals. | 1,778 | 325 | 144 | 98 | 249 | 24 | 2,615 | 916 | 3,531 |
| Fourth-order light stations with powerful fog signals. | 1,409 | 279 | 79 | 285 | 173 | 18 | 2,244 | 701 | 2,945 |
| Fourth-order light stations without fog signals. | 720 | 141 | 39 | 51 | 70 | 8 | 1,024 | 322 | 1,353 |
| Lens lantern. | 204 | 27 | 18 | 6 | 12 | 2 | 270 | 60 | 330 |
| Minor light, river districts. | 83 | ..... | 2 | ..... | 3 | ..... | 88 | 3 | 91 |
| Minor light, other districts. | 119 | ..... | 10 | ..... | 5 | ..... | 134 | 13 | 147 |
| High-pressure acetylene light. | 42 | 5 | 46 | 3 | 9 | 2 | 107 | 156 | 263 |
| High-pressure acetylene buoy. | ..... | ..... | 48 | ..... | 44 | 3 | 95 | 60 | 155 |
| Low-pressure acetylene buoy. | ..... | ..... | 150 | ..... | 34 | 2 | 186 | 62 | 248 |
| Oil-gas buoy. | ..... | ..... | 27 | ..... | 21 | 1 | 49 | 38 | 87 |

^a Figures include transportation charges of all kinds, such as freight on new buoys, etc.

^b Figures do not include cost of establishment of new aids.

^c Figures do not include renewal of appendages.

ENGINEERING AND CONSTRUCTION.

New works of principal importance under special appropriations completed during the fiscal year are as follows: Storehouse for oil, Woods Hole Lighthouse Depot, Mass.; Newark Bay lights, N. J.; Negro Point Light and Fog Signal, N. Y.; Buffalo Breakwater North End Light and Fog Signal Station, N. Y.; Sand Island Light Station, Ala., protection by riprap; San Juan Depot, P. R., improvements; St. Mary's River, Mich., lights. Thirty-eight isolated oil houses at light stations and a dwelling for the keeper at Kahola Point Light Station, Hawaii, were also completed.

Other important work in progress at the close of the fiscal year includes Rondout, N. Y., light and fog signal; Miah Maull Shoal, N. J., light and fog signal; Brandywine Shoal, Del., light and fog signal; Thimble Shoal, Va., light and fog signal; Atchafalaya Entrance Channel, La., aids to navigation; Galveston Jetty, Tex., light station; Navassa Island, West Indies, light station; Ashtabula, Lorain, and Cleveland, Ohio, light stations; Ashland, Wis., light and fog signal; Manistique, Mich., light and fog signal, and Cape St. Elias, Alaska, light and fog signal.

A new type of small beacon for submarine sites was developed during the year, consisting of a triangular plan black iron-pipe structure jettied and driven to the desired depth, carrying a pyramidal superstructure of galvanized pipe. In addition to the comparatively

small cost of such beacons, they possess the additional advantage of being repaired at small expense when damaged by collision.

In continuation of the work of developing standard plans and specifications for minor structures, designs were completed for iron substructures on four, seven, and nine reenforced concrete piles, with specifications covering their construction and erection.

Revised instructions governing the testing of coal were developed through the cooperation of the Bureau of Mines, Department of the Interior, which it is believed will simplify the matter of analyses, insuring at the same time the delivery of high-grade fuel.

An extensive inquiry was made into the question of lightning conductors, with special reference to the use of insulated clamps, and the advice of the Bureau of Standards obtained in the matter. Suitable instructions governing the question were then issued, which provide for making all extensive metal parts of structure a part of the conducting system, avoiding the use of insulators.

A new type of portable acetylene tank house has been built for use on pile dolphins where there is danger of the dolphin being damaged by collision or carried away by the ice. These houses are so constructed that they may be readily removed, with all gas apparatus, and are furnished with a float on a length of light chain, to mark the locality for grappling in case the structure is swept away.

The use of concrete in beacon structures has been further extended with success. Concrete beacons previously built in place of old wooden cribs have stood heavy ice with success, and several more have been built during the past year. New concrete veranda roofs have been installed at light stations and have proven far superior to the sheet-steel construction formerly employed. In cases of destruction of tall wooden tripods by the sea, these have been replaced with strongly braced reenforced concrete structures.

IMPROVEMENT OF APPARATUS AND EQUIPMENT.

As a result of the tariff reductions effected by the act of October 3, 1913, a lower scale of prices was effected on various types of imported apparatus.

Careful attention was given at the general lighthouse depot, Tompkinsville, N. Y., to the manufacture and standardization of many articles, and substantial savings were effected in the cases of various parts heretofore purchased from manufacturers.

Improved post lanterns, both one-day and eight-day types, were made up and are being put into service. Drawings showing the design and detail price lists were also prepared. Special care has been given to the production of a wind-proof lantern, which has been tested for months through many severe gales without blowing out.

A new type of oil-engine torch, generating an intense heat and permitting the starting of internal combustion kerosene engines in six minutes from the time of commencing to heat up the torch, was manufactured at an economical cost. This quick starting feature is of value in the event of sudden fog.

A number of tests were made with vertical mushroom trumpets to determine the proper height at which to secure the mushroom top above the mouth of a vertical trumpet, to determine the relative value of cowl and mushroom tops and also to determine the effect

of saturating compressed air with atomized water in suspension. In this test, about 2 feet was found to be the proper height of the mushroom top, which was found to give better results in general than the cowl top. No improvement in results was found by using saturated air.

Double mouth horns, 120° apart, were installed at a fog signal and found to give satisfactory results by effecting a wider and more even distribution of the sound.

Improvements were made in motor-driven electric fog-bell strikers by incasing the mechanism in a storm-proof casing, running all gears in a bath of oil, and adopting a generally heavy and safe construction, which permits distant control from a starting box connected with submarine cable, if necessary, to the bell.

A new type of lens clock with maintaining motion and a horizontal ball governor capable of adjustment while the clock is in motion was designed and manufactured. Other improved features include larger size drum, release for lowering weights, ball bearings for all shafts and design of gears and nuts to allow dismantling and accurate replacement or renewal without expert labor.

A starting cup for oil-vapor lamps was completed and issued, for greater economy in preheating the oil when lighting up. A new type of mantle holder was developed for another style of oil-vapor lamp, which, with a slightly increased expenditure of oil, considerably increases the effective candlepower.

A service installation of a three 55-millimeter mantle oil-vapor lamp was made in a first-order lens, with successful results, giving an intense light without difficulty of control.

New occulting devices, consisting of revolving screens, were installed at a number of stations, thus converting fixed lights to more distinctive characteristics at small cost. Another type, consisting of a cylindrical sleeve, raised and lowered by compressed air piped from the air receiver of the fog signal, and controlled by an electromagnetic timing device, was also installed.

The use of a submarine sentry in locating a bank far distant from shore on which a buoy was established was employed with success. This consists of a device towed at a constant depth which gives warning when bottom is struck.

An experimental installation was made of concentrated filament electric lamps in parabolic reflectors for range-light purposes. The apparatus is so arranged that it may be run either by commercial current or storage batteries, and in the event of the failure of one, the other is automatically cut into circuit; also in case of the failure of a lamp, a duplicate is automatically lighted.

In several other localities the use of electric lighting where a reliable supply of current is available has been extended. These are in general equipped either with automatic duplicating devices for substituting new bulbs on the failure of a filament, or relays which operate signal bells and lights in the keeper's quarters in case of any trouble. In some cases storage-battery auxiliaries have also been provided. New types of reflectors, made of glass with reflecting surface on the back, have also been placed in service.

Arrangements have been made for installing small plants at light-house depots for cleaning buoys, by means of oil engines, air compressors with tank, piping, and air tools, as it has been shown by

experience that this method is preferable to cleaning by hand, the work being done better, in less time, and with less injury to the metal.

An acetylene fog gun was imported and installed at a light station for service test toward the close of the fiscal year. Mariners have been requested to report their opinions as to the practical efficiency of the device.

Pneumatic valves, designed for operating sirens and whistles, have been tested in service and found satisfactory, being especially adapted for remote electrical control of the signals. Experiments have also been made with a new form of timing device for use with such apparatus.

To aid navigation on the interior rivers, post lights have been equipped with a number board bearing in large characters the serial number of the aid in the official light lists. In the same districts the use of a triangular lantern case has been extended with satisfactory results.

Arrangements have been made for the experimental installation of temporary unwatched acetylene lights for winter use at certain isolated stations in the Great Lakes, which, if successful, will permit the keepers to leave such stations under safer conditions, and yet give service to belated mariners after the close of the regular navigation season.

The use of thermostat alarms, designed to call keepers when the light burns either too high or too low, has been continued with success.

A new electrically operated flasher for gaslights has been designed for use in relief light vessels. The characteristic is controlled by clockwork located in the engine room, and may be adjusted to correspond with the characteristic of the station ship being relieved.

Improvement has been made in the construction of pressed glass lens lanterns by fitting them with storm panes and removable lens. An improved buoy lantern with pressed glass lens which will stand a considerable sudden change in temperature without injury, gauge valve, and heavy base for protecting the flasher from damage has also been designed.

The use of a new type of compound quick-opening whistle valve for fog signals has been extended, resulting in improvement of the signal and saving of compressed air formerly lost by leakage in older types.

APPROPRIATIONS AND EXPENDITURES.

The appropriations for the maintenance of the Lighthouse Service for the fiscal year 1915 were \$5,151,630, being \$79,700 in excess of those for the preceding fiscal year. The estimates for maintenance appropriations for 1915 were divided into one appropriation for general expenses of supplies, repairs, etc., and three appropriations for salaries, with an alternative providing for all maintenance appropriations in a single item. This alternative proposition was not authorized by Congress. It is believed, however, that with this form of appropriation a more economical and efficient administration of the Lighthouse Service could be effected, and in the estimates for the next fiscal year attention has been drawn to the fact that if this consolidation is authorized a reduction of \$25,000 in the total estimates

may be safely made. The appropriations for special works made for the fiscal year 1915 amounted to \$136,000. The average appropriations for special works for the ten preceding years, 1905 to 1914, inclusive, amounted to \$946,927.

The detailed estimates for the fiscal year 1916 are given on page 544. The total amount for general maintenance is \$106,400 more than the appropriation for the present year. The estimate for the Bureau of Lighthouses in Washington is \$900 more than the appropriation for the preceding year. Estimates for 27 special works have been submitted, aggregating \$1,493,500, considering only groups 1 and 2. This is \$1,357,500 more than the appropriation for special works for the preceding year, and includes a number of important works for which estimates were submitted last year, but which were not included in the appropriations. The estimates include two new lighthouse tenders, seven new light and fog-signal stations, three new light stations, one new lighthouse depot, four items for establishing or improving aids in general localities, one item for a new system of harbor or channel lights and other aids, five items for improvements of light or fog-signal stations or of groups of aids to navigation, three items for improvement of lighthouse depots, and one item for light keepers' dwellings.

In selecting and submitting estimates for those special works believed to be most important there were considered estimates submitted by officers in the various districts for new lighthouse and ship construction aggregating about \$4,765,000. Many items not included in the estimates for this year are thought to be meritorious, and the more important of them are included in group 3 of the estimates for special works, submitted for consideration as the resources of the Government permit them to be taken up. Explanation of the necessity for each of the items of special works is included with the estimates.

The tables following give comparisons of appropriations and expenditures for the Lighthouse Service, beginning with the fiscal year 1911 and including the estimates for 1916.

APPROPRIATIONS, LIGHTHOUSE SERVICE, FISCAL YEARS 1911-1915, WITH ESTIMATES FOR 1916.

[The salaries and allowances of officers of the Navy and Army on duty with the Lighthouse Service are not included in this table.]

| Item. | Appropriations. | | | | | Esti- mates, 1916 |
|---|-----------------|-----------|-----------|-----------|-----------|-------------------------|
| | 1911 | 1912 | 1913 | 1914 | 1915 | |
| MAINTENANCE. | | | | | | |
| Salaries, Bureau of Lighthouses | \$64,840 | \$64,630 | \$64,630 | \$64,510 | \$64,030 | \$64,930 |
| Supplies of lighthouses | 310,000 | | | | | |
| Salaries of keepers of lighthouses | 1,250,000 | 930,000 | 930,000 | 930,000 | 940,000 | 940,000 |
| Expenses of light vessels | 650,000 | | | | | |
| Expenses of buoyage | 400,000 | | | | | |
| Lighting of rivers | 250,000 | | | | | |
| Repairs, etc., of lighthouses | 625,000 | | | | | |
| Expenses of fog signals | 200,000 | | | | | |
| Oil houses for light stations | 10,000 | | | | | |
| Southeast Shoal Light Vessel, Lake Erie | 4,000 | | | | | |
| Great Lakes Channel lights | 4,000 | | | | | |
| Neebish Channel lights, St. Marys River, Mich. | 3,000 | | | | | |
| Maintenance of lighthouse tenders | 1,260,000 | | | | | |
| Repairs to lighthouse tenders | 160,000 | | | | | |
| Repairs of light vessels | 130,000 | | | | | |
| Pay of clerks, Lighthouse Service | 150,270 | | | | | |
| General expenses, Lighthouse Service | | 2,569,400 | 2,609,400 | 2,750,000 | 2,775,000 | 2,840,000 |
| Salaries, lighthouse vessels | | 1,007,420 | 957,420 | 967,420 | 997,600 | 1,028,100 |
| Salaries, Lighthouse Service | | 405,960 | 475,960 | 360,000 | 375,000 | 385,000 |
| Total for maintenance | 5,471,110 | 5,037,410 | 5,037,410 | 5,071,930 | 5,151,630 | 5,258,030 |
| Unexpended balances (obligations estimated) | 369,663 | 125,400 | 73,742 | 33,920 | | |
| SPECIAL WORKS. | | | | | | |
| New light and fog signal stations | 68,000 | 700,950 | 69,000 | 432,500 | 63,000 | 423,000 |
| Light vessels | | 75,000 | 380,000 | 125,000 | | 270,000 |
| Lighthouse tenders | | 7,000 | | | | 75,000 |
| Keepers' dwellings | | | | | | 75,000 |
| Improvement of aids | | 110,000 | 77,500 | 22,600 | 50,000 | 514,500 |
| Lighthouse depots | | 100,000 | | 125,000 | 23,000 | 211,000 |
| Total for special works | 68,000 | 992,950 | 526,500 | 722,600 | 136,000 | 1,493,500 |
| Total maintenance and special works | 5,539,110 | 6,030,360 | 5,563,910 | 5,794,530 | 5,287,630 | 6,751,530 |

EXPENDITURES FROM APPROPRIATIONS, LIGHTHOUSE SERVICE, FISCAL YEARS 1910-1914.

[Actual expenditures, regardless of year of appropriation.]

| Expenditures— | 1910 | 1911 | 1912 | 1913 | 1914 |
|-------------------|-------------|-------------|-------------|-------------|-------------|
| For maintenance | \$5,032,312 | \$5,046,063 | \$5,058,049 | \$5,037,778 | \$5,167,609 |
| For special works | 706,377 | 414,296 | 310,885 | 461,627 | 538,338 |
| Total | 5,738,689 | 5,460,359 | 5,368,934 | 5,499,405 | 5,704,947 |

DEPOTS.

The Lighthouse Service maintains 44 depots in the various districts for the storage and distribution of supplies and for other purposes. The act of October 22, 1913, contained an appropriation of \$125,000 for a depot in the sixth district, to replace the present depot at Castle Pinckney, Charleston Harbor, which owing to its exposed position is

unsatisfactory. After a series of public hearings, at which full opportunity was given for the presentation of various sites, and an inspection of the principal sites by officers of the Department and the Bureau, selection was made of the property known as Chisolm's Mill, Ashley River, Charleston, S. C. The purchase was completed subsequent to the close of the fiscal year and plans are now being prepared for the necessary improvements..

The act of August 1, 1914, subsequent to the close of the fiscal year, contained an appropriation of \$23,000 for a new carpenter shop at the general lighthouse depot, Tompkinsville, N. Y., to replace the present frame structure, which is a grave menace in case of fire. Plans for the new structure are now under consideration.

Improvements were made at depots in the following districts during the year:

In the first district a 10,000-gallon tank was erected on high ground in back of the buildings at Little Diamond Island, Me., as a precaution against fire.

In the second district a new fireproof storehouse for oils and carbide was constructed at Woods Hole, Mass., to replace a frame building.

In the third district extensive repairs, including a new reinforced concrete deck, were practically completed to the south dock at Tompkinsville, N. Y., and the new machinery in the recently completed powerhouse was placed in commission.

In the following districts provision should be made for improved depot facilities:

In the second district the present depot at Lovells Island, Boston Harbor, is for a number of reasons unsatisfactory, and Congress has authorized the transfer for this purpose of the old marine-hospital site at Chelsea, Boston. This property is now under lease to private parties. The question of obtaining possession of this or some other suitable site is under consideration.

The depot at Woods Hole, Mass., also in the second district, although well located for the work of the Service in the vicinity, is not as useful as it should be, on account of shallow water around the dock and approaches. Estimates are submitted for dredging the channel and basin around the wharf and for the erection of a brick storehouse to replace the present wooden one.

In the third district estimates are submitted for improvement to the offices and laboratory.

In the eleventh district estimates are submitted for repairs and improvements at the depot at Detroit, Mich.

The headquarters of the twelfth district were moved from Chicago, Ill., to Milwaukee, Wis., on September 17, 1913. The present depot is practically surrounded by coal yards and the coal dust is objectionable. Estimate has been submitted, to be considered by Congress as resources permit, for the purchase of a new site and construction of a depot.

In the sixteenth district, which in 1910 was organized as a separate lighthouse district, no permanent arrangement has yet been made for a depot, but temporary space is being rented at Ketchikan. An estimate has been submitted, to be considered by Congress as resources permit, for the purchase of a site and the necessary equipment for a lighthouse depot in Alaska.

In the eighteenth district estimates are submitted, for consideration as resources permit, for repairs and improvements to the Goat Island Depot, Cal.

In the nineteenth district the headquarters of the Lighthouse Service are at Honolulu, and storage facilities are either rented or granted by the courtesy of other branches of the Government. The establishment of a permanent depot in this district would facilitate the work of the Service, and estimates are submitted for that purpose.

LIGHTHOUSE TENDERS.

The tenders of the Service have been employed to the best advantage during the year. The 45 vessels which have been in commission have steamed a total of about 439,000 nautical miles in their work of supplying light stations, maintaining the buoyage system, transporting construction materials, and carrying the officers and employees of the Service to their stations or on inspection duty.

Contract was awarded on September 9, 1913, for the medium-draft lighthouse tender *Laurel*, for service in the fifth lighthouse district. The vessel was launched at Baltimore, Md., on June 24, 1914, and will probably be completed during the present fiscal year.

Contract was awarded on April 17, 1914, for the small tender *Fern*, for service in the inside waters of the sixteenth lighthouse district (Alaska). The contractors began the assembling of materials shortly after the close of the fiscal year.

The tender *Woodbine*, propelled by an internal combustion kerosene engine, was placed in commission in the fifth lighthouse district on March 1, 1914.

An estimate of \$250,000 has been submitted for the construction of a tender to replace the *Armeria*, which was wrecked and lost on May 20, 1912. It is proposed to use this tender for general lighthouse work as required in Alaskan waters.

Authority has been requested to extend the use of the appropriation of \$200,000 heretofore made for the construction of two tenders, for the construction of two or more tenders for general service, it being thought that additional small tenders may be constructed out of this appropriation.

With the increase in the number of aids to navigation and the deterioration of older vessels it will probably be necessary to construct on an average one or two new tenders each year. The services of tenders may be somewhat lessened in the future by planning of light vessels that will not use so much coal, as, for instance, by substituting oil fuel and oil engines, or by replacement of present steam-power plants by internal-combustion engines.

An estimate has been submitted for a light-draft tender and barge for use in establishing and maintaining aids along the intercoastal waterways of Texas and Louisiana; and an estimate has been submitted, for consideration as resources permit, for a medium-sized tender for general service on the Atlantic coast.

The continuance of the plan of systematic docking, painting, and minor repairs to tenders during the year has resulted in higher efficiency and better maintenance.

The following tenders have either been extensively overhauled or such work has been started during the fiscal year 1914: *Arbutus*, *Columbine*, *Jessamine*, *Lilac*, and *Myrtle*.

It is probable that during the current year extensive overhaul will be completed or undertaken on the following tenders: *Crocus*, *Goldenrod*, *Ivy*, *Larkspur*, *Mangrove*, *Oleander*, and *Pansy*.

The following was the number of tenders of the Lighthouse Service on June 30 of the years specified, omitting vessels not having regular crews and those less than 50 feet in length: 1910, 51; 1911, 46; 1912, 45; 1913, 44; 1914, 45. On June 30, 1914, the following was the status of the tenders: In actual service, 40; indefinitely laid up, 0; undergoing repairs, 5.

LIGHT VESSELS.

The Lighthouse Service maintains light vessels on 52 stations and has for this purpose 66 light vessels, of which 14 are relief vessels. Some of these vessels are old, 9 having been built over 50 years ago; one is 65 years old. Some of the older vessels are in a condition which does not warrant extensive repairs.

Light vessel *No. 82*, while marking Buffalo Light-Vessel Station, pending the completion of the station ship, was lost with all on board in the storm of November 8-10, 1913. Particulars of this matter appear on page 476.

An appropriation of \$125,000 was made by the act of October 22, 1913, for a light vessel for the Southwest Pass Entrance to the Mississippi River, La., and plans for this vessel, to be designated *No. 102*, are under preparation.

The construction of new light vessels *No. 96* and *No. 98* at Muskegon, Mich., was well advanced during the year. These vessels will be used on the Great Lakes. *No. 96* was launched on April 21, 1914, and *No. 98* on June 9, 1914. It is expected that both will be completed during the current fiscal year.

Plans are in preparation for the construction of first-class light vessels *No. 99* and *No. 100* and second-class light vessel *No. 101*.

In connection with the design of new light vessels consideration has been given to making all parts of such vessels readily accessible for cleaning, painting, and overhauling which it is believed will effect a considerable economy in future repairs of such vessels.

Instructions were issued during the year providing for the proper protection of submarine bells on light vessels when not in use.

The following light vessels have either been extensively overhauled or such work has been started during the last fiscal year:

No. 53. Relief.

No. 54. Boston, Mass.

| No. 78. Relief.

| No. 91. Winter Quarter, Va.

It is probable that during the current fiscal year extensive overhaul will be completed or undertaken on the following light vessels:

No. 67. Umatilla, Wash.

| No. 72. Relief.

The following was the total number of light vessels and stations on June 30 of the years named:

| Year. | Light vessels. | Light-vessel stations. |
|-----------|----------------|------------------------|
| 1910..... | 68 | 54 |
| 1911..... | 63 | 51 |
| 1912..... | 65 | 51 |
| 1913..... | 67 | 53 |
| 1914..... | 66 | 52 |

Of the present light vessels 34 have self-propelling machinery and 31 are provided only with sail power. One (Bush Bluff) has no means of propulsion.

On June 30, 1914, the following was the status of the light vessels: Regular vessels on station, 43; relief vessels on station, 9; relief vessels at depots, 3; regular vessels under repair, 9; relief vessels under repair, 2.

COOPERATION.

Special effort has been continued to consult the needs of maritime interests as to aids to navigation and to cooperate with other branches of the Government having interest in or relations with the work of this Service.

Cooperation with the United States Engineer officers in charge of river improvements in the river districts has been continued with entire success.

Cooperation with the Navy Department was extended by the promulgation of joint regulations dated January 20, 1914, governing repairs to vessels and obtaining of marine stores at navy yards and naval stations.

The facilities of Navy Department radio stations for the transmission of official radiograms, both from shore and vessel stations, were extended to the Lighthouse Service.

Arrangements were made with the Treasury Department for the detail of officers of the Public Health Service, when available, for inspection of the sanitary conditions and general health of employees at isolated stations and on vessels.

Joint regulations covering the lighting of fish pounds, to be included in permits which may be granted by the War Department for the erection of fishing structures and appliances, were issued during the year.

Arrangements were made to cooperate with the Department of Agriculture in enforcing the regulations for the protection of migratory birds approved by the President on October 1, 1913, by furnishing copies of such regulations to keepers and other employees and directing them to report violations promptly.

Instructions were issued to furnish the Department of Labor, at stated intervals, data regarding subcontracts on contract works of construction and repair in force in the Lighthouse Service.

Instructions cooperating with the Treasury Department for standard sizes and rules regarding towels used in public buildings were issued.

Arrangements were made for the recovery of valuable buoys adrift on the high seas by cooperation between the radio stations of the Navy Department and revenue cutters of the Treasury Department cruising in the vicinity of such drifting buoys.

Arrangements were made for cooperation with the Revenue-Cutter Service, Treasury Department, whereby wrecks discovered by that Service on the Florida Reefs will be promptly reported to the proper lighthouse inspector, to permit issuing a notice to mariners in order that vessels navigating in the vicinity may not be misled as to their own positions.

Cooperation with the Bureau of Navigation, Department of Commerce, was also arranged, whereby vessels of that Bureau will notify the nearest lighthouse inspector, by radio when practicable, of any defects observed in aids to navigation.

SAVING OF LIFE AND PROPERTY.

During the fiscal year 1914 services in saving of life and property were rendered and acts of heroism performed by employees of the Lighthouse Service on vessels or at stations on 124 occasions, a list of which is given on page 532.

REPORT OF OPEN-MARKET PURCHASES.

In compliance with the act of June 17, 1910, there is submitted separately as a part of this report a list of purchases of materials and supplies for the Lighthouse Service made without obtaining bids under public advertisement, with the reasons for so purchasing.

INVESTIGATION OF THE LIGHTHOUSE SERVICE.

During the fiscal year an extended investigation was made of the personnel and methods of the Lighthouse Service by a committee of the Department of Commerce, consisting of the following officers: Hon. William C. Redfield, Secretary of Commerce, chairman; Hon. Edwin F. Sweet, Assistant Secretary of Commerce, and Dr. S. W. Stratton, Director of the Bureau of Standards. The report of the committee is quoted in full on page 502. As a result of this investigation, one employee of the Bureau of Lighthouses in Washington and twelve employees in the third lighthouse district, Tompkinsville, N. Y., were dismissed from the service.

LEGISLATION ENACTED AFFECTING THE LIGHTHOUSE SERVICE.

The following is a summary of special legislation affecting the Lighthouse Service enacted at the first and second sessions of the Sixty-third Congress to August 1, 1914.

Authority was given by the act of October 22, 1913, amending the previous authority granted by the act of March 4, 1913, for the purchase of necessary additional land for light stations and depots, for the payment for such land to be made from the appropriation "General expenses, Lighthouse Service," the total sum to be expended for this purpose in any fiscal year to be restricted to \$3,000. Such purchases must be made under rules prescribed by the Secretary of Commerce, and no single acquisition of such additional land may cost in excess of \$500.

Authority was granted by the act of October 22, 1913, to pay a claim in the sum of \$22.50, and by the act of April 6, 1914, to pay two claims in the sums of \$10 and \$65.38, respectively, all for damages occasioned by collisions for which vessels of the Lighthouse Service were found to be responsible.

Authority was granted by the act of October 22, 1913, to use the unexpended balance of the appropriation of \$15,000 heretofore made for a light and fog signal station at or near the west end of the draw near the Lehigh Valley Railroad bridge across Newark Bay, N. J., for establishing beacon lights to mark the channel in Newark Bay, N. J.

Appropriations were made for the following special works by the act of October 22, 1913: Depot for the sixth lighthouse district, \$125,000; aids to navigation in Atchafalaya Entrance Channel, La., \$50,000; light vessel for the Southwest Pass entrances to the Mississippi River, La., \$125,000; light station on Navassa Island, West Indies, \$125,000; improvement of aids to navigation at Ashtabula Harbor, Ohio, \$45,000; improvement of fog-signal station at Cleveland, Ohio, \$17,600; light and fog signal station and improvement of aids to navigation at Lorain Harbor, Ohio, \$35,000; aids to navigation at Ashland, Wis., \$25,000; pierhead light and lighted buoy at Oconto Harbor, Wis., \$5,000; aids to navigation in Manistique Harbor, Mich., \$20,000; light and fog signal at or near Cape St. Elias, Alaska, \$115,000; aids to navigation and improvement of existing aids in Puget Sound and adjacent waters, Wash., \$30,000; improvement of Warrior Rock Light Station, Oreg., \$2,000; completion of unfinished portion of Government road from Rollerville to the Point Arena Lighthouse, Cal., \$3,000.

Authority was granted by the act of March 9, 1914, for the leasing of an unused portion of the Fdz Hook Lighthouse Reservation, Wash., to the city of Port Angeles, Wash., for a period of 99 years, with suitable restrictions and safeguards.

The act of May 26, 1914, authorizing the Secretary of War to grant the use of the Fort McHenry Military Reservation, Md., to the city of Baltimore for park purposes, contained a clause excepting that portion in use by the Lighthouse Service, with the electric pole line leading thereto.

The following appropriations were made by the act of August 1, 1914, subsequent to the close of the fiscal year: Carpenter shop for the general lighthouse depot, Tompkinsville, N. Y., \$23,000; completion of Kilauea Point Light Station, Kauai Island, Hawaii, \$3,000; aids to navigation in Alaska, \$60,000, and aids to navigation at the entrances to the Cape Cod Canal, Mass., \$50,000.

The same act contained a provision for leave of absence with pay for per diem employees, which is being submitted again for legislation in a more precise form.

SPECIAL LEGISLATION NEEDED.

The following additional legislation for the Lighthouse Service is considered desirable:

The salaries of lighthouse inspectors are, by the act of June 17, 1910, limited to \$2,400 a year, except the inspector of the third district, whose salary is fixed at \$3,600. The salary of \$2,400 is inadequate

because of the heavy responsibilities with which the inspector is charged and the technical and business ability required to successfully discharge the duties. The compensation of these positions should be sufficient to bring into and retain in the Lighthouse Service a class of persons fully competent to efficiently conduct such important work. The inspectors should be men of high character and qualifications, including technical knowledge as to engineering and nautical affairs, and should have business ability.

It is believed that the Secretary of Commerce should be authorized to increase the pay of crews of lighthouse vessels as may be necessary to secure competent service. There has been increasing difficulty in obtaining competent seamen, and others of crews for such vessels in recent years, and as a result lighthouse tenders engaged on important buoy work have during the past season in some cases not been able to maintain full crews or have had their crews made up largely of inexperienced men. This condition is believed to be due to the fact that the pay of these crews, and particularly of the seamen, has not been increased materially for a number of years, whereas pay in other Government services, and in the merchant marine generally, has been raised; for instance, the pay of seamen in the Revenue-Cutter Service on the Atlantic coast was increased by 20 per cent five years ago, and is now much higher than the similar pay in the Lighthouse Service, and in addition such seamen receive an allowance for uniforms and for reenlistment. The work of seamen on tenders of the Lighthouse Service is unusually severe, and thoroughly competent men are required to render these vessels efficient on the important work in which they are engaged.

Recommendation is made that employees of the Service compensated at a per diem rate be granted 15 working days' leave of absence, including sick leave, each year without forfeiture of pay during such absence, no such employee to be entitled to any leave until he has served 12 consecutive months, when he may be granted 15 days' leave; and during the second or any subsequent year 15 days' leave at the rate of one and one-fourth days per month, as earned, to be granted from the beginning of the second service year, within the discretion of the lighthouse inspector as to the time when the leave can be allowed without detriment to the Service. It is believed that the granting of this leave would be of benefit to both the employees and the Lighthouse Service.

Recommendation is made that authority be granted to establish and maintain post-lantern lights and other aids to navigation, out of the annual appropriations for the Lighthouse Service, on Lakes Okechobee and Hicpochee and connecting waterways across the State of Florida. The lighting of rivers or inland waters is limited to those specifically authorized by Congress, and such authority has not been granted for the waters specified. Petitions of maritime interests in these localities have urged the establishment of lights and investigation by the Lighthouse Service has found the same to be warranted.

Authority is also requested for the purchase or construction of suitable models of lighthouse vessels from appropriations made by Congress for the construction and equipment of such vessels. Such models would be useful in carrying out the construction of

new vessels, as well as for other vessels of similar type to be constructed in the future.

Authority is also requested that the annual appropriations for the Lighthouse Service be made available for defraying the expenses of cooperation between the Lighthouse Service and the Forest Service in the management of forest land on lighthouse reservations. A number of lighthouse reservations in the Great Lakes either contain at present a considerable growth of timber, or are suitable for growing timber for sale commercially or for supplying the needs of the Lighthouse Service. An examination of a number of reservations by officers of the Forest Service and the Lighthouse Service has led to the formulation of a plan of cooperation whereby a systematic forest management might be established. With the gradual exhaustion of white cedar, it is becoming more difficult to obtain the timber required for spar buoys, and it is estimated that by an expense of not over \$2,000 per year all forest areas on reservations on the Great Lakes may be brought to a productive state.

Authority is also requested that the provisions of the act of August 24, 1912, relative to the administering of oaths to travel accounts or other expenses against the United States be extended to chief clerks in the offices of lighthouse inspectors, or other employees in the Lighthouse Service designated by them, and that such persons be authorized to administer oaths of office to employees. On account of the wide scope of the Lighthouse Service and the isolation of many stations and vessels, the granting of this authority will avoid the hardships and delays occasioned by the present requirements.

Authority is also requested for the transfer of a portion of the Tawas Lighthouse Reservation, Mich., to the Treasury Department for life-saving purposes. This land is not needed for the Lighthouse Service, and affords the most suitable location on Tawas Bay for the boathouse and launchways of the Tawas Life-Saving Station.

Authority is also requested that the penalties now provided for interference with aids to navigation maintained by the Lighthouse Service be extended to private aids lawfully maintained under proper authority. The law authorizing the establishment of private aids provides penalties for failure of the owners to maintain such aids properly, and it has been found that for lack of legal protection, an owner may not be justly at fault for improper maintenance, and it is therefore believed, in equity to the owners, that such protection should be extended to them.

Authority is also requested that the Secretary of Commerce be empowered to exchange rights of way in connection with lighthouse reservations. This is considered desirable for the best interests of the Service, as in many cases the existing rights of way over land leading to lighthouse reservations may, with the authority requested, be exchanged for others, more direct and suitable in character.

It is also recommended that the Secretary of Commerce be authorized, in his discretion, to use the unexpended balance of the appropriation for a tender made by the acts of May 27, 1908, and March 4, 1909, as modified by the act of July 27, 1912, for the construction of additional tenders for general service. It is now thought that additional small tenders may be constructed out of this appropria-

tion, and authority is therefore requested to extend the use of the unexpended balance for that purpose.

There is great need for provision by law for the retirement of employees of the Lighthouse Service who after long service have lost their ability for active duty by reason of age or disability incident to their work. This is essential to full efficiency in the administration of the Service. In the report for 1912 a statement was given showing the practice in a number of important foreign countries with reference to the pensioning of employees in the respective lighthouse services in common with other civil employees in those countries, from which it appears that a retirement system is in force with favorable results under all of the other governments mentioned.

The statistics as to the various classes of aids to navigation and fuller details on many of the subjects mentioned in this report will be found in the pages following.

Respectfully,

GEORGE R. PUTNAM,
Commissioner of Lighthouses.

TO HON. WILLIAM C. REDFIELD,
Secretary of Commerce.

STATISTICS AND ESTIMATES.

LIST OF OFFICERS OF THE BUREAU OF LIGHTHOUSES AND THE LIGHTHOUSE DISTRICTS.

OFFICERS OF THE BUREAU OF LIGHTHOUSES ON JUNE 30, 1914.

George R. Putnam.....Commissioner of Lighthouses.
 John S. Conway.....Deputy Commissioner.
 H. B. Bowerman.....Chief Constructing Engineer.
 Edward C. Gillette ^a.....Superintendent of Naval Construction.
 Principal Assistant Engineer, Rudolph Zirpel.^b
 Inspector for general duty, E. M. Trott.
 Examiner, Thomas Flood.^c

INSPECTORS IN CHARGE OF LIGHTHOUSE DISTRICTS JULY 1, 1913, TO SEPT. 1, 1914.

| District. | Name. | From— | To— |
|-----------|---|---------------|---------------|
| 1st... | C. E. Sherman..... | July 17, 1911 | |
| 2d... | R. H. Goddard..... | June 27, 1912 | |
| 3d... | J. T. Yates..... | June 20, 1912 | |
| 4th... | T. J. Rout..... | Mar. 1, 1912 | |
| 5th... | E. C. Rutland..... | May 1, 1912 | |
| 6th... | H. D. King..... | Apr. 15, 1912 | |
| 7th... | W. C. Dibrell..... | do..... | Aug. 21, 1913 |
| | W. W. Demeritt..... | Aug. 22, 1913 | |
| 8th... | B. B. Dorry..... | June 6, 1912 | |
| 9th... | C. A. Lamy..... | Aug. 7, 1912 | |
| 10th... | Roscoe House..... | June 4, 1912 | |
| 11th... | E. L. Woodruff..... | Aug. 19, 1912 | |
| 12th... | L. M. Stoddard..... | Aug. 16, 1912 | |
| 13th... | Maj. Charles Keller, Corps of Engineers, U. S. Army..... | July 31, 1910 | Oct. 15, 1913 |
| | Maj. George M. Hoffman, Corps of Engineers, U. S. Army..... | Oct. 16, 1913 | |
| 14th... | Lieut. Col. H. Jervy, Corps of Engineers, U. S. Army..... | Jan. 17, 1911 | |
| 15th... | Col. C. McD. Townsend, Corps of Engineers, U. S. Army..... | Aug. 1, 1912 | |
| 16th... | R. L. Hankinson..... | Mar. 23, 1912 | Aug. 21, 1913 |
| | W. C. Dibrell..... | Aug. 22, 1913 | |
| 17th... | H. L. Beck..... | July 6, 1911 | |
| 18th... | H. W. Rhodes..... | July 6, 1912 | |
| 19th... | A. E. Arledge..... | Sept. 3, 1912 | |

JURISDICTION OF LIGHTHOUSE SERVICE.

The United States Lighthouse Service is charged with the establishment and maintenance of aids to navigation and with all equipment and work incident thereto on the sea and lake coasts of the United States, on the rivers of the United States so far as specifically authorized by law, and on the coasts of all other territory under the jurisdiction of the United States, with the exception of the Philippine Islands and Panama. In the Philippine Islands the lighthouse service is maintained by the insular government and supported entirely out of the revenues of the islands. At Panama the Isthmian Canal Commission has charge of the lighting of the canal and approaches under the general appropriations for the construction of the canal.

All the work of establishing and maintaining the aids to navigation under the jurisdiction of the Lighthouse Service is performed directly by that service through district organizations, with the exception of a few minor aids, which are maintained by contract, and the exception of the American Samoan Islands, the island of Guam, and Guantanamo, Cuba, where the aids are maintained under the supervision of the naval commandants under allotments made from the appropriations for the Lighthouse Service. The Lighthouse Service also has supervision over the establishment and maintenance of private aids to navigation and the lighting of bridges over navigable waters of the United States.

^a From Mar. 18, 1914.

^b From Mar. 28, 1914.

^c From Mar. 10, 1914.

At the present time the United States assists in the maintenance of but one lighthouse outside of its territory, this being at Cape Spartel, Morocco. This light is maintained in accordance with the convention between Morocco and the United States, Austria, Belgium, Spain, France, Great Britain, Italy, Netherlands, Portugal, and Sweden, in force since March 12, 1867. The lighthouse was constructed at the expense of Morocco, but it is maintained by the other contracting powers. The annual appropriation by the United States for this purpose is \$325, and it is not under the control of the Lighthouse Service.

The jurisdiction of the Lighthouse Service over rivers not included in tidewater navigation is restricted to such as are specifically named in the various acts of Congress. These now include practically all the important navigable rivers and lakes of the country.

The following table shows the coast line of the United States and Territories under the jurisdiction of the United States, that designated general coast line being measured by steps of 30 miles, and that designated detailed coast line by steps of 3 miles; there are also given the lengths of the coastal and interior rivers and tributaries so far as they are lighted.

| | General coast line. | Detailed coast or channel line. |
|---|-----------------------|---------------------------------|
| | <i>Statute miles.</i> | <i>Statute miles.</i> |
| Atlantic and Gulf coasts of the United States..... | 3,480 | 9,732 |
| Pacific coast of the United States..... | 1,404 | 3,294 |
| Porto Rico, adjacent United States islands, and Guantanamo..... | 374 | 449 |
| Great Lakes and connecting waters, United States portion..... | 2,520 | 4,020 |
| Alaska..... | 7,300 | 22,654 |
| Hawaiian Islands and Midway Islands..... | 788 | 1,018 |
| Guam..... | 86 | 92 |
| American Samoan Islands..... | 76 | 91 |
| Total coast line under United States Lighthouse Service..... | 16,028 | 41,350 |
| Coastal rivers on which aids to navigation are maintained by the United States Lighthouse Service (Atlantic and Gulf coasts, 1,374 miles; Pacific coast, 242 miles)..... | | 1,615 |
| Interior rivers on which aids to navigation are maintained by the United States Lighthouse Service (Mississippi River, 1,816 miles; Ohio River, 966 miles; Missouri River, 390 miles; other rivers, 690 miles)..... | | 3,861 |
| Total coast line and rivers under United States Lighthouse Service..... | | 46,828 |
| Philippine Islands (lighted by Philippine Government)..... | 4,080 | 11,511 |
| Panama Canal Zone (coast line only)..... | 17 | 40 |
| Total seacoast line under the jurisdiction of the United States (not including Great Lakes and rivers)..... | 17,605 | 48,881 |

LIMITS OF LIGHTHOUSE DISTRICTS.

First district.—From the head of navigation on the St. Croix River, Me., the north-eastern boundary of the United States, to and including Hampton Harbor, N. H. It embraces all aids to navigation on the seacoast of Maine and New Hampshire, and on all tidal waters between the limits named.

Second district.—From Hampton Harbor, N. H., to Elisha Ledge, off Warren Point, R. I., but not including either the harbor or the ledge. It embraces all aids to navigation on the seacoast and tidal waters of Massachusetts, except on the Taunton River and that part of Mount Hope Bay lying within the State boundary.

Third district.—From Elisha Ledge, off Warren Point, R. I., to Cape May, on the coast of New Jersey, excepting Cape May Lighthouse, and to a point on the coast opposite Rehoboth, Del., excepting Cape Henlopen Lighthouse and Hen and Chickens Shoal. It embraces all aids to navigation on the coasts of Rhode Island, Connecticut, New York, and New Jersey northward of Cape May, including Northeast End, Five-Fathom Bank, and Overfalls light vessels, and McCries Shoal, and on all tidal waters tributary to the sea or Long Island Sound between the limits named, together with the aids on Whitehall Narrows, and on the United States waters of Lakes Champlain and Memphremagog.

Fourth district.—From and including Cape May Light Station, on the coast of New Jersey, to and including Fenwick Island Light Station on the coast of Delaware. It embraces all aids to navigation on the seacoast of New Jersey and Delaware between

the points named, the entrance to Delaware Bay, Delaware Bay and River, and the waters tributary thereto, but does not include McCries Shoal, Overfalls Light Vessel, and the aids to navigation seaward thereof, nor the shoals seaward of Fenwick Island.

Fifth district.—From (but not including) Fenwick Island Light Station, on the coast of Delaware, to and including New River Inlet, N. C. It embraces all aids to navigation off the seacoast of Delaware seaward of Fenwick Island, on the seacoasts of Maryland, Virginia, and North Carolina, between the limits named, all of Chesapeake Bay, the sounds of North Carolina, and tributary waters.

Sixth district.—From (but does not include) New River Inlet, N. C., to and including Hillsboro Inlet Light Station, Fla. It embraces all aids to navigation on the seacoasts, bays, sounds, harbors, rivers, and other tidal waters of North Carolina, South Carolina, Georgia, and Florida between the limits named.

Seventh district.—From a point just south of Hillsboro Inlet Light Station to and including Cedar Keys, Fla. It embraces all aids to navigation on the sea and Gulf coasts of Florida, Florida Keys, and on other waters tributary to the sea and Gulf between the limits named.

Eighth district.—From (but not including) Cedar Keys, Fla., to the southern boundary of Texas. It embraces all aids to navigation on the Gulf coast of the United States and tidal waters tributary to the Gulf between the limits named, together with those on the Mississippi River below and including New Orleans, and on Grand Lake and Lake Chicot.

Ninth district.—The island of Porto Rico and the adjacent islands and other islands and stations ceded to the United States in the West Indies.

Tenth district.—From the mouth of the St. Regis River, St. Lawrence River, N. Y., to the mouth of the Detroit River. It embraces all aids to navigation on the United States shores and waters of Lakes Ontario and Erie and the upper part of the St. Lawrence River and the Niagara River, excepting aids to navigation at the mouth of the Detroit River.

Eleventh district.—From and including all aids to navigation at the mouth of the Detroit River, Mich., to the western end of Lake Superior. It embraces all aids to navigation on the United States shores and waters of Lakes St. Clair, Huron, and Superior, the Detroit River, including the mouth, the St. Clair and St. Marys Rivers, and that part of the Straits of Mackinac lying to the eastward of a line drawn across the straits just to the eastward of Old Mackinac Point Light Station, Mich.

Twelfth district.—Includes all aids to navigation on Lake Michigan, Green Bay, and tributary waters lying west of a line drawn across the Straits of Mackinac just east of Old Mackinac Point Light Station, Mich.

Thirteenth district.—The Mississippi River from the head of navigation to the mouth of the Missouri River; the Minnesota River from the head of navigation to its mouth; the Illinois River from the head of navigation to its mouth; the Osage River from the head of navigation to its mouth; the Gasconade River from the head of navigation to its mouth; the Missouri River from the head of navigation to its mouth; St. Croix River and Lake; Lake Traverse; and includes all aids to navigation within these limits and navigable rivers tributary thereto.

Fourteenth district.—The Ohio River from Pittsburgh, Pa., to Cairo, Ill.; the Tennessee River from the head of navigation to its mouth; the Kanawha River from the head of navigation to its mouth; and embraces all aids to navigation within these limits and navigable rivers tributary thereto.

Fifteenth district.—The Mississippi River from and including the mouth of the Missouri River to New Orleans, La.; the Red River from the head of navigation to its mouth; and includes all aids to navigation within these limits and navigable rivers tributary thereto.

Sixteenth district.—From the boundary between Alaska and the Dominion of Canada to the boundary between Alaska and Siberia. It embraces all aids to navigation on the seacoast, bays, rivers, and other tidal waters of Alaska.

Seventeenth district.—From the boundary between California and Oregon to the northern boundary of the United States. It embraces all aids to navigation on the seacoast of Oregon and Washington, on the United States waters of the Strait of Juan de Fuca, Washington Sound, and the Strait of Georgia, and on the tidal waters tributary to the sea, straits, and sounds between the limits named.

Eighteenth district.—From the boundary between California and Mexico to the boundary between California and Oregon. It embraces all aids to navigation on the seacoast, bays, rivers, and other tidal waters of California.

Nineteenth district.—Embraces the Hawaiian Islands, the Midway Islands, the island of Guam, and the American Samoan Islands, and includes all aids to navigation in the waters thereof.

LOCATION OF DISTRICT OFFICES OF THE UNITED STATES LIGHTHOUSE SERVICE, WITH ADDRESS OF THE LIGHTHOUSE INSPECTOR.

| District. | Address. | District. | Address. |
|-----------|--|-----------|--|
| 1st..... | Portland, Me., Y. M. C. A. Building. | 11th..... | Detroit, Mich., Post Office Building. |
| 2d..... | Boston, Mass., 19 Congress Street. | 12th..... | Milwaukee, Wis., Federal Building. |
| 3d..... | Tompkinsville, N. Y. | 13th..... | Rock Island, Ill., Federal Building. |
| 4th..... | Philadelphia, Pa., Post Office Building. | 14th..... | Cincinnati, Ohio, Customhouse. |
| 5th..... | Baltimore, Md., New Customhouse. | 15th..... | St. Louis, Mo., Customhouse. |
| 6th..... | Charleston, S. C., Old Post Office Building. | 16th..... | Ketchikan, Alaska. |
| 7th..... | Key West, Fla. | 17th..... | Portland, Oreg., Customhouse. |
| 8th..... | New Orleans, La., Customhouse. | 18th..... | San Francisco, Cal., Customhouse. |
| 9th..... | San Juan, P. R. | 19th..... | Honolulu, Hawaii, McCandless Building. |
| 10th..... | Buffalo, N. Y., Federal Building | | |

LIGHTHOUSE DEPOTS MAINTAINED ON JUNE 30, 1914.

[The principal depot of the district is indicated by the larger type.]

| District. | Location. | District. | Location. |
|-----------|---|-----------|-----------------------------------|
| 1st..... | Bear Island, Me. | 8th..... | Fort San Jacinto, Tex. |
| 2d..... | LITTLE DIAMOND ISLAND, ME. | | Mobile, Ala. |
| | LOVELLS ISLAND, BOSTON HARBOR, MASS. | 9th..... | PORT EADS, LA. |
| 3d..... | Woods Hole, Mass. | | Culebrita Island, P. R. |
| | Absecon, N. J. | | Guantanamo Bay, Cuba. |
| | TOMPEKINSVILLE, STATEN ISLAND, N. Y. | 10th..... | SAN JUAN, P. R. |
| | Goat Island, R. I. | | BUFFALO, N. Y. |
| | Juniper Island, Vt. | | Erie, Pa. |
| | New London, Conn. | | Maumee Bay, Ohio. |
| 4th..... | Tucker Beach, N. J. | | Rock Island, N. Y. |
| | EDGEWOOD, DEL. | | Sandusky Bay (Cedar Point), Ohio. |
| 5th..... | Lewes, Del. | 11th..... | DETROIT, MICH. |
| | Annapolis, Md. | | Minnesota Point, Minn. |
| | Chincoteague, Va. | | St. Marys River, Mich. |
| | Lazaretto Point, Md. | 12th..... | Charlevoix, Mich. |
| | Point Lookout, Md. | | Milwaukee, Wis. |
| | PORTSMOUTH, VA. | | St. JOSEPH, MICH. |
| | Washington Wharf, D. C. | 16th..... | KETCHIKAN, ALASKA. |
| 6th..... | Washington, North Carolina. | | Ediz Hook, Wash. |
| | CASTLE PRICKNEY, CHARLESTON HARBOR, S. C. | 17th..... | TONGUE POINT, OREG. |
| 7th..... | Egmont Key, Fla. | 18th..... | GOAT ISLAND, CAL. |
| | KEY WEST, FLA. | 19th..... | HONOLULU, HAWAII. |

REPORT OF COMMITTEE APPOINTED BY THE SECRETARY OF COMMERCE TO INVESTIGATE CONDITIONS IN THE LIGHTHOUSE SERVICE.

This investigation was conducted by us as a committee pursuant to the written request dated October 4, 1913, of the Commissioner of Lighthouses that "the Bureau of Lighthouses would be glad to have and would invite any such full and complete investigation of its work and expenditures as may be deemed advisable," and to a letter from Mr. A. V. Conover, dated November 18, 1913, requesting that his relations with the Department and with the American Gasaccumulator Co. "be thoroughly and fully investigated." It took under its consideration the statement dated November 20, 1913, entitled "Statement of Conditions Existing in the United States Lighthouse Service," prepared by Mr. William J. LaVarre under instructions of the Department.

With the purpose throughout the inquiry of the full and complete investigation of the work and expenditures of the Bureau of Lighthouses the committee gave full consideration to every charge or complaint against the Lighthouse Service, without regard to the source of such charge or complaint, and with the sole purpose of turning the fullest possible light upon the Bureau of Lighthouses, its official personnel, the relations existing between superiors and subordinates, the method of conducting its business—whether loose and extravagant or businesslike and economical—and scrutinized most closely the dealings of the Bureau with private individuals and corporations with reference to the existence of any possible evil influence.

The hearings of the committee were held at the city of Washington, D. C., and at Tompkinsville, Staten Island. The documentary and oral evidence taken cover about 3,000 pages of letter-size paper.

The hearings were public, the only persons excluded being those who were to appear as witnesses, who were not permitted to be present during the taking of the testimony of others upon matters concerning which they themselves were to be examined. In this respect the usual court procedure in important cases was followed.

The fullest possible opportunity was given for the examination and cross-examination of every witness, and no pains or expense were spared to procure the attendance of witnesses from a distance if there was reason to believe that they might throw any light upon the matters under investigation.

The charges filed by Mr. W. J. LaVarre were given the most careful and painstaking consideration. All the witnesses presented by Mr. LaVarre in support of his charges were heard with the utmost patience, and whenever there was any evidence of embarrassment on the part of these or any other witnesses they were reminded that the sole purpose of the committee was to ascertain the truth concerning all facts bearing upon the Lighthouse Service, and that the fullest protection would be extended no matter who might be benefited or who might be injured by their testimony. There were some direct contradictions and, necessarily, some testimony upon which the committee could place no reliance; but considering the great amount of testimony taken the sum total of the conflicting evidence was less than would naturally be expected and less than occurs in most important cases in courts of justice.

On all the essential points investigated there was such a preponderance of evidence upon one side or the other that there was scarcely any doubt as to what the findings of the committee ought to be, and upon every point the decision of the committee is unanimous.

With respect to the charges presented by Mr. LaVarre the committee finds that none of them is sustained by the evidence. On the contrary, it finds that loyalty to the service and a high degree of discretion and business ability characterized the conduct of the Commissioner and his chief assistants in the selection of district inspectors, in the economies which have been effected, in the selection of the most suitable and efficient aids to navigation, and in the general conduct of the business of the Bureau.

It was somewhat unfortunate that the former deputy commissioner resigned from the Lighthouse Service and accepted an important position in a private corporation which manufactures a gas buoy used by the Government. The fact that essential parts of this particular buoy are covered by patents diminished the opportunities for competition and materially increased the embarrassment under which the Bureau was placed. That suspicions were entertained and charges of favoritism were made is not surprising. It was for the committee to determine whether there was any foundation for the suspicions and whether the charges were just.

The stock books of the private corporation and substantially all important facts connected with it from the date of its organization in this country were placed before the committee, the contract under which the former Deputy Commissioner of Lighthouses entered the service of the private corporation, and the facts connected therewith, were disclosed. The attitude of the Bureau of Lighthouses toward this corporation both before and after the former deputy commissioner entered its service was most thoroughly investigated, and the committee finds that the business dealings of the Bureau of Lighthouses with the private corporation mentioned have been and are above criticism, and entirely free from any taint or just suspicion.

The committee finds that since the reorganization of the Lighthouse Service about four years ago there has been, as might naturally be expected, a small dissatisfied and discontented element. In a few instances this extended to insubordination. During the progress of the investigation the committee deemed it advisable to recommend some dismissals from the service. In each case the committee was a unit and its recommendation was promptly put into execution. There can be no doubt as to the justice or wisdom of the changes that have been made. It is not practicable, in this report, to give in detail the reasons for each of the recommendations mentioned, but they were all duly considered and are fully sustained by the evidence.

WILLIAM C. REDFIELD,
Secretary.

EDWIN F. SWEET,
Assistant Secretary.

S. W. STRATTON,
Director Bureau of Standards.

July 6, 1914.

EXPLANATION OF TABLE ON PAGE 505.

The table of aids to navigation includes all those maintained by the Lighthouse Service, a total of 14,198. On page 519 are given facts regarding the private aids to navigation, 658 in number, maintained under authority. In the statistics, relief light vessels are not counted and duplicate or auxiliary lights and fog signals are not counted, but double lights are counted separately when maintained on distinct structures or for distinct purposes. Buoys for the purpose of marking the positions of light vessels or larger buoys are not counted. Fog signals at light stations or on vessels are counted as separate aids, but not those attached to buoys, except in the case of submarine bells, which are counted as separate signals, whether on vessels or on buoys. Otherwise each buoy is counted only once, and if it is included in a higher class it is not in the lower class. Light-vessel lights are not counted separately.

AIDS TO NAVIGATION MAINTAINED BY THE UNITED STATES LIGHTHOUSE SERVICE JUNE 30, 1914.

[See note on p. 504.]

| Class. | 1st dist. | 2d dist. | 3d dist. | 4th dist. | 5th dist. | 6th dist. | 7th dist. | 8th dist. | 9th dist. | 10th dist. | 11th dist. | 12th dist. | 13th dist. | 14th dist. | 15th dist. | 16th dist. | 17th dist. | 18th dist. | 19th dist. | Total. |
|----------------------------------|-----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------|
| LIGHTED AIDS. | | | | | | | | | | | | | | | | | | | | |
| Hyper-radiant lights. | 2 | 5 | 5 | 2 | 8 | | 8 | 3 | | | | | | | | | 9 | | 1 | 1 |
| First-order lights. | 7 | 3 | 2 | | 2 | | 0 | 2 | 1 | | | | | | | | | 9 | | 57 |
| Second-order lights. | 3 | 1 | 4 | | 1 | | 4 | 4 | 7 | | | | | | | | | 1 | 2 | 23 |
| Third-order lights. | 6 | 2 | 1 | 3 | | | 1 | 2 | 2 | 5 | 10 | 9 | | | | | 2 | 4 | 1 | 70 |
| Three-and-one-half-order lights. | | | | | | | | | | | | | | | | | | | | 119 |
| Fourth-order lights. | 34 | 95 | 56 | 11 | 49 | 3 | 5 | 12 | 2 | 22 | 32 | 5 | 2 | | | | 15 | 20 | 8 | 342 |
| Fifth-order lights. | 19 | 15 | 17 | 7 | 22 | 3 | 1 | 13 | 2 | 12 | 12 | 13 | | | | | 4 | 1 | 3 | 143 |
| Sixth-order lights. | 1 | 5 | 23 | 2 | 9 | 7 | | | 4 | 13 | 6 | 17 | | | | | 1 | | | 81 |
| Range lights. | | | | | | | | | | | | | | | | | | | | 33 |
| Range-light lights. | | | | | | | | | | | | | | | | | | | | 30 |
| Radiator lights. | 2 | 7 | 9 | 10 | 6 | 37 | 2 | 2 | | | 24 | 2 | | | | | 2 | | | 90 |
| Minor lights. | 8 | 13 | 52 | 13 | 58 | 48 | 41 | 152 | 13 | 32 | 84 | 4 | 467 | 568 | 667 | 61 | 22 | 30 | 38 | 709 |
| Electric lights without lens. | 1 | 17 | 171 | 29 | 231 | 167 | 24 | 72 | | 1 | 87 | 8 | | | | | 23 | 13 | 1 | 2,791 |
| Lighthouse stations. | 1 | 11 | 10 | | 8 | | | | | | | | | | | | | | | 52 |
| Gas-lighted buoys. | 4 | 30 | 56 | 9 | 52 | 5 | 4 | 22 | 1 | 32 | 71 | 17 | | | | | 3 | 2 | | 327 |
| Gas and whistling buoys. | 6 | 3 | 10 | | 8 | 6 | 2 | 3 | | | 1 | 1 | | | | | 5 | 8 | 4 | 73 |
| Gas and aerial ball buoys. | | | | | | | | | | | | | | | | | | | | |
| Float lights. | | 4 | 14 | 5 | 10 | 1 | 1 | | | | 11 | 14 | | | | | | | | 118 |
| Total. | 92 | 150 | 430 | 102 | 463 | 303 | 89 | 294 | 31 | 135 | 367 | 171 | 530 | 605 | 667 | 108 | 304 | 105 | 58 | 5,004 |
| Lights on fixed aids. | 81 | 93 | 341 | 88 | 385 | 281 | 82 | 266 | 30 | 90 | 279 | 133 | 467 | 568 | 667 | 102 | 289 | 86 | 53 | 4,381 |
| Lights on floating aids. | 11 | 57 | 89 | 14 | 78 | 22 | 7 | 28 | 1 | 45 | 88 | 38 | 63 | 37 | | | 6 | 15 | 19 | 623 |
| Total lighted aids. | 92 | 150 | 430 | 102 | 463 | 303 | 89 | 294 | 31 | 135 | 367 | 171 | 530 | 605 | 667 | 108 | 304 | 105 | 58 | 5,004 |
| UNLIGHTED AIDS. | | | | | | | | | | | | | | | | | | | | |
| Fog signals, engine power. | 19 | 21 | 37 | 5 | 14 | 4 | | 3 | | 9 | 39 | 46 | | | | | 23 | 28 | | 257 |
| Fog signals, clock power. | 37 | 13 | 57 | 7 | 70 | 2 | | 13 | | 4 | 5 | 9 | | | | | 1 | 8 | | 230 |
| Fog signals, hand power. | 12 | 2 | 3 | | | | 1 | | | | 2 | | | | | | | | | 20 |
| Fog signals, electric. | | | | | | | | | | | | | | | | | | | | 12 |
| Submarine signals. | 2 | 11 | 6 | | 7 | 4 | | 2 | | | 5 | 5 | | | | | 2 | 2 | | 48 |
| Buoys, whistling (unlighted). | 46 | 32 | 56 | 8 | 25 | 7 | 3 | 7 | 1 | | | | | | | | 4 | 18 | 3 | 86 |
| Buoys, bell (unlighted). | 20 | 11 | 6 | | | | | | | | | | | | | | | | | 23 |
| Buoys, iron. | 144 | 80 | 152 | 117 | 267 | 272 | 227 | 177 | 102 | 15 | 25 | 25 | | | | | 11 | 14 | 1 | 1,983 |
| Buoys, spar (wood). | 672 | 549 | 775 | 86 | 939 | 9 | | 37 | | 149 | 491 | 109 | 375 | | | | 111 | 129 | 39 | 51 |
| Daymarks, beacons, etc. | 193 | 86 | 53 | 2 | 233 | 482 | 134 | 117 | | | 3 | 1 | 430 | 54 | | | 43 | 30 | 68 | 1,973 |
| Total unlighted aids. | 1,145 | 803 | 1,152 | 225 | 1,568 | 787 | 371 | 372 | 107 | 177 | 574 | 198 | 805 | 54 | | | 358 | 171 | 126 | 9,194 |
| Grand total. | 1,237 | 953 | 1,582 | 327 | 2,021 | 1,090 | 460 | 666 | 138 | 312 | 941 | 399 | 1,335 | 659 | 667 | 319 | 662 | 276 | 184 | 14,198 |

DETAILS AS TO CHARACTERISTICS OF LIGHTS (NOT INCLUDING LIGHT VESSELS).

| | 1st dist. | 2d dist. | 3d dist. | 4th dist. | 5th dist. | 6th dist. | 7th dist. | 8th dist. | 9th dist. | 10th dist. | 11th dist. | 12th dist. | 16th dist. | 17th dist. | 18th dist. | 19th dist. | Total. |
|--|-----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|------------|------------|--------|
| Fixed white: | | | | | | | | | | | | | | | | | |
| Sixth order and above.. | 30 | 29 | 46 | 17 | 63 | 33 | 4 | 24 | 6 | 23 | 29 | 20 | 6 | 5 | 4 | 4 | 343 |
| Lights below the sixth order..... | 2 | 10 | 92 | 20 | 173 | 116 | 37 | 122 | 5 | 7 | 63 | 8 | 29 | 184 | 16 | 16 | 900 |
| Lighted buoys..... | | 1 | 5 | | 1 | | 2 | | | | | | | | | | 13 |
| Fixed red: | | | | | | | | | | | | | | | | | |
| Sixth order and above.. | 14 | 12 | 21 | 2 | 11 | 15 | | 6 | 2 | 12 | 40 | 31 | | | | 3 | 169 |
| Lights below the sixth order..... | 6 | 13 | 117 | 13 | 76 | 84 | 24 | 97 | 8 | 17 | 50 | 27 | 4 | 63 | 26 | 13 | 652 |
| Lighted buoys..... | | 2 | 6 | | | | | 1 | | 8 | | | 2 | | | 1 | 20 |
| Flashing or occulting: | | | | | | | | | | | | | | | | | |
| Sixth order and above.. | 15 | 15 | 38 | 27 | 20 | 15 | 10 | 9 | 4 | 20 | 33 | 15 | 2 | 21 | 32 | 6 | 282 |
| Lights below the sixth order..... | 2 | 7 | 21 | 9 | 5 | 15 | 6 | 5 | | 9 | 43 | 18 | 61 | 8 | 7 | 11 | 227 |
| Lighted buoys..... | 10 | 43 | 64 | 14 | 70 | 17 | 7 | 23 | | 35 | 83 | 31 | 1 | 14 | 17 | 4 | 433 |
| Fixed and flashing, sixth order and above..... | 12 | 7 | 3 | | 4 | 3 | 3 | 3 | 5 | 2 | 12 | 14 | | 3 | 1 | | 72 |
| Candlepower: ^a | | | | | | | | | | | | | | | | | |
| 50,000 to 190,000..... | 4 | 4 | 2 | 2 | 3 | 6 | 6 | 5 | 5 | | 1 | 1 | | 1 | 7 | 1 | 48 |
| 200,000 to 490,000..... | | 1 | 3 | | 1 | 1 | 1 | 1 | | | 1 | 1 | | 1 | 2 | 1 | 14 |
| 500,000 and over..... | | 1 | 1 | | | | 3 | | | | | | 1 | | | | 6 |
| Twin light stations..... | 2 | 3 | | | | | | | | | | | | | | | 5 |
| Stations with resident keepers..... | 70 | 51 | 112 | 33 | 93 | 27 | 14 | 49 | 17 | 38 | 78 | 76 | 9 | 34 | 40 | 17 | 758 |

^a The apparent reductions in candlepower from those given in 1913 are due to ratings based on actual measurements and not to any reductions in the intensities of the lights.

DETAILS AS TO ILLUMINANTS OF LIGHTS (NOT INCLUDING LIGHT VESSELS).

| | 1st dist. | 2d dist. | 3d dist. | 4th dist. | 5th dist. | 6th dist. | 7th dist. | 8th dist. | 9th dist. | 10th dist. | 11th dist. | 12th dist. | 16th dist. | 17th dist. | 18th dist. | 19th dist. | Total. |
|--|-----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|------------|------------|--------|
| Incandescent oil vapor..... | 27 | 24 | 36 | 18 | 18 | 14 | 11 | 11 | 10 | 3 | 26 | 13 | 1 | 22 | 30 | 4 | 268 |
| Oil (wick lamps): | | | | | | | | | | | | | | | | | |
| Sixth order and above.. | 45 | 36 | 70 | 18 | 76 | 43 | 3 | 31 | 7 | 44 | 62 | 62 | 7 | 5 | 5 | 8 | 522 |
| Lights below the sixth order..... | 7 | 22 | 196 | 33 | 269 | 200 | 59 | 175 | 13 | 24 | 109 | 29 | 38 | 245 | 37 | 28 | 1,484 |
| Lighted buoys..... | | | | | 1 | | | | | 10 | | | | | | | 11 |
| Acetylene: | | | | | | | | | | | | | | | | | |
| Sixth order and above.. | | 1 | 1 | 10 | 2 | 8 | 3 | | | 10 | 7 | 1 | | 2 | 1 | 1 | 47 |
| Lights below the sixth order..... | 2 | 7 | 31 | 9 | 5 | 15 | 6 | 49 | | 9 | 12 | 21 | 62 | 5 | 7 | 11 | 251 |
| Lighted buoys..... | 5 | 13 | 30 | 2 | 9 | 17 | 5 | 3 | | | 16 | 2 | | 10 | 7 | 4 | 123 |
| Oil gas: | | | | | | | | | | | | | | | | | |
| Lights with mantles..... | | | | | 13 | | | | | | 56 | | | | | | 56 |
| Lights without mantles..... | | | | | | | | | | | 1 | 1 | | | | | 15 |
| Lighted buoys with mantles..... | 1 | 1 | 22 | 1 | 45 | | | 5 | | 35 | 67 | 29 | | 4 | 6 | | 216 |
| Lighted buoys without mantles..... | 4 | 32 | 23 | 11 | 16 | | 2 | 18 | 1 | | | 1 | | | 4 | | 112 |
| Electric arc: | | | | | | | | | | | | | | | | | |
| Sixth order and above.. | | | 1 | | | | | | | | | | | | | 1 | 1 |
| Lights below the sixth order..... | 1 | | | | | | | | | | | | | 2 | | 1 | 4 |
| Electric incandescent: | | | | | | | | | | | | | | | | | |
| Sixth order and above.. | | | | | | | 2 | | | | 5 | 1 | | | | | 8 |
| Lights below the sixth order..... | | 1 | 3 | | | | | | | | 1 | 2 | | 8 | 5 | 1 | 21 |
| Gas (coal), sixth order and above..... | | 2 | | | | 1 | | | | | | 1 | | | | | 4 |
| Gas (oil), sixth order and above..... | | | | | | | | | | | | | 2 | | | | 2 |
| Gas (oil), below the sixth order..... | | | | | | | | | | | | | | | | | 0 |

DETAILS AS TO LIGHTS ON LIGHT VESSELS.

| | 1st dist. | 2d dist. | 3d dist. | 5th dist. | 6th dist. | 8th dist. | 11th dist. | 12th dist. | 17th dist. | 18th dist. | Total. |
|--|-----------|----------|----------|-----------|-----------|-----------|------------|------------|------------|------------|--------|
| Characteristics as to lights: | | | | | | | | | | | |
| 1 fixed white light..... | | 1 | 1 | | 1 | | 5 | 5 | | | 13 |
| 2 fixed white lights..... | | 3 | 4 | 2 | 2 | 2 | | | 2 | 1 | 16 |
| 1 fixed red light..... | | 2 | | | | | | 1 | | | 3 |
| 2 fixed red light..... | | 3 | | 1 | | | | | | | 4 |
| 1 fixed white and 1 fixed red light..... | | 1 | | 2 | 1 | | | | 1 | | 5 |
| 1 white flashing, or occulting, and 1 fixed red light..... | | | 2 | | | | | | | | 2 |
| 1 white light, flashing or occulting..... | 1 | 1 | 2 | 2 | | | | | | 1 | 7 |
| 2 white occulting lights..... | | | 1 | 1 | | | | | | | 2 |
| Illuminants: | | | | | | | | | | | |
| Incandescent oil vapor..... | | | | | 1 | | | | | | 1 |
| Acetylene..... | 1 | | 1 | | | | | | | | 2 |
| Oil (wick)..... | | 10 | 4 | 6 | 3 | 2 | 5 | 6 | 3 | 1 | 40 |
| Oil (wick) and acetylene..... | | | 1 | | | | | | | | 1 |
| Oil (wick) and oil gas with mantle..... | | | 1 | | | | | | | | 1 |
| Electric arc..... | | | 1 | | | | | | | | 1 |
| Electric incandescent..... | | 1 | 2 | 2 | | | | | | 1 | 1 |
| Illuminating apparatus: | | | | | | | | | | | |
| Fourth order..... | | | | | 1 | | | | | | 1 |
| Reflector..... | | 5 | 3 | 4 | 2 | 1 | 1 | | 1 | | 17 |
| Reflector and lens lantern..... | | 1 | 2 | | | | | | | | 3 |
| Lens lantern..... | 1 | 5 | 5 | 4 | 1 | 1 | 4 | 6 | 2 | 2 | 31 |

DETAILS AS TO FOG SIGNALS.

| Kind and how operated. | 1st dist. | 2d dist. | 3d dist. | 4th dist. | 5th dist. | 6th dist. | 7th dist. | 8th dist. | 10th dist. | 11th dist. | 12th dist. | 16th dist. | 17th dist. | 18th dist. | Total. |
|---|-----------|-----------|------------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|------------|-------------|
| Steam: | | | | | | | | | | | | | | | |
| Whistle..... | 9 | 9 | 6 | | 5 | 3 | | 2 | 5 | 34 | 31 | | 4 | 8 | 116 |
| Siren..... | | 1 | 1 | | | | | | | | | | 1 | 1 | 4 |
| Air: | | | | | | | | | | | | | | | |
| Whistle..... | | 2 | 21 | 1 | 4 | 1 | | | 4 | 5 | 6 | 1 | | 1 | 12 |
| Siren..... | 2 | 2 | | | | | | | | | | 4 | 7 | 18 | 77 |
| Sireno (electric)..... | | | | | | | | | | | | | | 2 | 2 |
| Reed horn..... | 5 | 5 | 9 | 4 | 4 | | 1 | | | | | 4 | 11 | | 46 |
| Submarine bells: | | | | | | | | | | | | | | | |
| On light vessels, driven by compressed air..... | 1 | 7 | 7 | | 7 | 3 | | 2 | | 3 | 4 | | 3 | 2 | 39 |
| On bottom, electric power..... | | | | | | | | | | 2 | 1 | | | | 3 |
| On buoys, operated by sea..... | 1 | 1 | 2 | | | 1 | | | | | | | 1 | | 6 |
| Bell: | | | | | | | | | | | | | | | |
| Clockwork..... | 37 | 13 | 57 | 7 | 70 | 2 | | 13 | 4 | 5 | 9 | 1 | 4 | 8 | 230 |
| Electric..... | | 2 | 4 | | | | | | | 3 | | | | | 10 |
| Engine..... | | | 1 | | | | | | | | | | | | 1 |
| Hand..... | 12 | | 3 | | | | | | | 1 | | | | | 16 |
| Horn: | | | | | | | | | | | | | | | |
| Hand..... | | 2 | | | | | 1 | | | 1 | | | | | 4 |
| Electric..... | | | | | | | | | | | | | 1 | | 1 |
| Total..... | 70 | 45 | 110 | 12 | 91 | 10 | 1 | 18 | 13 | 54 | 60 | 10 | 31 | 43 | 6567 |

* Auxiliary fog signals are not included (75 signals).

**LIGHTED AIDS, EXCLUSIVE OF LIGHTED BUOYS, IN COMMISSION ON
JUNE 30, 1914, USING ILLUMINANTS OTHER THAN LIQUID OIL.**

INCANDESCENT OIL-VAPOR LIGHTS (268 LIGHTS).

| District. | Location. | District. | Location. |
|-----------|--|-----------|--|
| 1s..... | Avery Rock, Me. Baker Island, Me. Boon Island, Me. Cape Neddick, Me. Dice Head, Me. Egg Rock, Me. Great Duck Island, Me. Halfway Rock, Me. Isles of Shoals, N. H. Libby Islands, Me. Matineus Rock North, Me. Matineus Rock South, Me. Monhegan Island, Me. Mount Desert, Me. Moose Peak, Me. Owl'shead, Me. Petit Manan, Me. Portsmouth Harbor (Newcastle), N. H. Rockland Breakwater, Me. Saddleback Ledge, Me. Seguin, Me. The Cuckolds, Me. Two-Bush Island, Me. West Quoddy Head, Me. Whaleback, Me. Whitehead, Me. Wood Island, Me. | 3d. | Sandy Hook, N. J. Sea Girt, N. J. Shinnecock Bay, N. Y. Staten Island, N. Y. Stratford Shoal (Middle Ground), N. Y. Tucker Beach, N. J. West Bank, N. Y. Watch Hill, R. I. |
| 2d..... | Boston, Mass. Cape Ann North, Mass. Cape Ann South, Mass. Cape Cod, Mass. Cape Poge, Mass. Chatham North, Mass. Chatham South, Mass. Cuttyhunk, Mass. Dumpling Rock, Mass. Duxbury Pier, Mass. Gay Head, Mass. Long Island Head, Mass. Minots Ledge, Mass. Monomoy Point, Mass. Nantucket (Great Point), Mass. Nauset Beach, Mass. Nobska Point, Mass. Plymouth (Gurnet), Mass. Plymouth (Gurnet) Beacon, Mass. Race Point, Mass. Sankaty Head, Mass. Tarpaulin Cove, Mass. The Graves, Mass. West Chop, Mass. | 4th..... | Bellevue Range Rear, Del. Brandywine Shoal, Del. Cape Henlopen, Del. Cape May, N. J. Delaware Breakwater Range Front, Del. Elbow of Cross Ledge, N. J. Fenwick Island, Del. Fourteen-Foot Bank, Del. Harbor of Refuge, Del. Listons Range Front, Del. Listons Range Rear, Del. Mahon River, Del. Miah Maull Shoal, N. J. New Castle Range Rear, Del. Reedy Island Range Front, Del. Reedy Island Range Rear, Del. Schooner Ledge Range Rear, Pa. Ship John Shoal, N. J. |
| 3d..... | Barnegat, N. J. Beavertail, R. I. Block Island North, R. I. Block Island Southeast, R. I. Chapel Hill, N. J. Conover Beacon, N. J. Eatons Neck, N. Y. Elm Tree Beacon, N. Y. Execution Rocks, N. Y. Falkner Island, Conn. Fire Island, N. Y. Great Captain Island, Conn. Hereford Inlet, N. J. Horton Point, N. Y. Little Gull Island, N. Y. Ludlam Beach, N. J. Montauk Point, N. Y. New Dorp, N. Y. New London Ledge, Conn. North Hook Beacon, N. J. Old Field Point, N. Y. Pecks Ledge, Conn. Plum Island, N. Y. Point Comfort, N. J. Point Judith, R. I. Race Rock, N. Y. Romer Shoal, N. Y. | 5th..... | Assateague, Va. Bodi Island, N. C. Cape Charles, Va. Cape Hatteras, N. C. Cape Henry, Va. Cape Lookout, N. C. Cove Point, Md. Currituck Beach, N. C. Hog Island, Va. Hooper Island, Md. Ocracoke, N. C. Point No Point, Md. Sandy Point, Md. Sharps Island, Md. Smith Point, Va. Thomas Point Shoal, Md. Wolf Trap, Va. York Spit, Va. |
| 4th..... | | 6th..... | Cape Canaveral, Fla. Cape Fear, N. C. Cape Romain, S. C. Charleston, S. C. Frying-Pan Shoals Light Vessel No. 94, N. C. Georgetown, S. C. Hillsboro Inlet, Fla. Hunting Island, S. C. Jupiter Inlet, Fla. Mosquito Inlet, Fla. St. Augustine, Fla. St. Johns River, Fla. St. Simon, Ga. Sapelo, Ga. Tybee, Ga. |
| 5th..... | | 7th..... | Alligator Reef, Fla. American Shoal, Fla. Anclote Keys, Fla. Carysfort Reef, Fla. Dry Tortugas, Fla. Egmont Key, Fla. Fowey Rocks, Fla. Key West, Fla. Sand Key, Fla. Sanibel Island, Fla. Sombrero Key, Fla. Bollivar Point, Tex. Cape St. George, Fla. Cape San Blas, Fla. Matagorda, Tex. Pensacola, Fla. Sabine Bank, Tex. Sabine Pass, La. |
| 6th..... | | 8th..... | |

LIGHTED AIDS, EXCLUSIVE OF LIGHTED BUOYS, IN COMMISSION ON JUNE 30, 1914,
USING ILLUMINANTS OTHER THAN LIQUID OIL—Continued.

INCANDESCENT OIL-VAPOR LIGHTS—Continued.

| District. | Location. | District. | Location. |
|------------|---|------------|----------------------------|
| 8th | Sand Island Range Front, Ala. | 16th | Cape Hinchinbrook, Alaska. |
| | Ship Shoal, La. | 17th | Alki Point, Wash. |
| | South Pass Range Rear, La. | | Burrows Island, Wash. |
| 9th | Southwest Pass Range Rear, La. | | Cape Arago, Oreg. |
| | Arecibo, P. R. | | Cape Blanco, Oreg. |
| | Cape Rojo, P. R. | | Cape Disappointment, Wash. |
| | Cape San Juan, P. R. | | Cape Flattery, Wash. |
| | Culebrita Island, P. R. | | Cape Meares, Wash. |
| | Mona Island, P. R. | | Desdemona Sands, Oreg. |
| | Muertos Island, P. R. | | Destruction Island, Wash. |
| | Point Borinquen, P. R. | | Ediz Hook, Wash. |
| | Point Jiguero, P. R. | | Grays Harbor, Wash. |
| | Point Tuna, P. R. | | Heceta Head, Oreg. |
| 10th | Port San Juan, P. R. | | New Dungeness, Wash. |
| | Cleveland West Breakwater Pierhead, Ohio. | | North Head, Wash. |
| | Dunkirk, N. Y. | | Patos Islands, Wash. |
| 11th | Fairport, Ohio. | | Point Wilson, Wash. |
| | Au Sable, Mich. | | Semiamoo Harbor, Wash. |
| | Big Bay Point, Mich. | | Smith Island, Wash. |
| | Detroit River, Mich. | | Tillamook Rock, Oreg. |
| | Detour, Mich. | | Umpqua River, Oreg. |
| | Duluth Range Rear, Minn. | | West Point, Wash. |
| | Eagle Harbor, Mich. | 18th | Yaquina Head, Oreg. |
| | Fort Gratiot, Mich. | | Ano Nuevo Island, Cal. |
| | Harbor Beach Harbor o Refuge East Entrance North, Mich. | | Bonita Point, Cal. |
| | Huron Island, Mich. | | Cape Mendocino, Cal. |
| | Isle aux Peches Range Front, Mich. | | Carquinez Strait, Cal. |
| | Manitou, Mich. | | East Brother Island, Cal. |
| | Marquette, Mich. | | Farallon Island, Cal. |
| | Outer Island, Mich. | | Fort Point, Cal. |
| | Passage Island, Mich. | | Goat Island, Cal. |
| | Point Iroquois, Mich. | | Humboldt, Cal. |
| | Pointe aux Barques, Mich. | | Los Angeles Harbor, Cal. |
| | Portage Lake Ship Canals, Mich. | | Male Rocks, Cal. |
| | Presque Isle, Mich. | | Piedras Blancas, Cal. |
| | Rock of Ages, Mich. | | Pigeon Point, Cal. |
| | Spectacle Reef, Mich. | | Point Arena, Cal. |
| | Split Rock, Minn. | | Point Arguello, Cal. |
| | Stannard Rock, Mich. | | Point Cabrillo, Cal. |
| | Superior Entry South Breakwater, Wis. | | Point Conception, Cal. |
| | Thunder Bay Island, Mich. | | Point Fermin, Cal. |
| | Two Harbors, Minn. | | Point Hueneme, Cal. |
| | Whitefish Point, Mich. | | Point Loma, Cal. |
| 12th | Big Sable, Mich. | | Point Montara, Cal. |
| | Calumet Harbor, Ill. | | Point Pinos, Cal. |
| | Cana Island, Wis. | | Point Reyes, Cal. |
| | Chicago Harbor, Ill. | | Point Sur, Cal. |
| | Grand Traverse, Mich. | | Punta Gorda, Cal. |
| | Grossepoint, Ill. | | Roe Island, Cal. |
| | Old Mackinac Point, Mich. | | St. George Reef, Cal. |
| | Point Betsie, Mich. | | San Luis Obispo, Cal. |
| | South Manitou, Mich. | | Santa Barbara, Cal. |
| | Sturgeon Bay Canal, Wis. | | Trinidad Head, Cal. |
| | Tall Point, Wis. | 19th | Barbers Point, Hawaii. |
| | Twin River Point, Wis. | | Diamond Head, Hawaii. |
| | White Shoal, Mich. | | Kilauea Point, Hawaii. |
| | | | Makapuu Point, Hawaii. |

ACETYLENE LIGHTS (207 LIGHTS).

| | | | |
|-----------|--|----------|--|
| 1st | House Island, Me. | 3d | Cold Spring Inlet, N. J. |
| | Steele Ledge Monument, Me. | | Cooks Sedges, 13, N. J. |
| 2d | Base River West Jetty, Mass. | | Cornfield Point Light Vessel No. 48, Conn. |
| | Billingsgate Island, Mass. | | Fuller Rock, R. I. |
| | Black Marsh Channel, Mass. | | Glencove Breakwater, N. Y. |
| | Black Rocks, Mass. | | Goose Neck Point, 11, N. J. |
| | Nantucket East Breakwater, Mass. | | Great Kills, N. J. |
| | Sandy Point, Mass. | | Great Salt Pond Breakwater, Outer End, R. I. |
| | Upper Turn, Mass. | | Jones Rocks, Conn. |
| 3d | White Rocks, Mass. | | Junction, N. J. |
| | Block Island Breakwater, R. I. | | Little Silver, 8, N. J. |
| | Block Island Breakwater Outer Basin, R. I. | | Low Moor, 7, N. J. |
| | Brantford Reef, Conn. | | Lower Rocky Point, 2, N. J. |
| | Centerville, N. J. | | |

LIGHTED AIDS, EXCLUSIVE OF LIGHTED BUOYS, IN COMMISSION ON JUNE 30, 1914,
USING ILLUMINANTS OTHER THAN LIQUID OIL—Continued.

ACETYLENE LIGHTS—Continued.

| District. | Location. | District. | Location. |
|-----------|---|------------|--|
| 3d | Mill Rock Southerly, N. Y. Negro Point, N. Y. New London Harbor, Conn. Northeast End Light Vessel No. 44, N. J. Northwest Point, 2A, N. J. Pamapo, N. J. Point Judith Harbor of Refuge Main Breakwater East, R. I. Point Judith Harbor of Refuge Main Breakwater Center, R. I. Point Judith Harbor of Refuge Main Breakwater West, R. I. Point Judith Harbor of Refuge East Breakwater, R. I. Saltersville, N. J. Sands Point, 4, N. J. Sandy Point Breakwater, Conn. Sea Haven, N. J. South Hook Beacon, N. J. U. S. Dike, 1, N. J. U. S. Dike, 3, N. J. | 8th | Southwest Pass, East Jetty, La. Texas City Channel, Tex. (5 lights). |
| 4th | Belleuve Range Front, Del. Billingsport Range Front, N. J. Cherry Island Range Front, Del. Cohansey, N. J. Eagle Point Range, N. J. (2 lights). East Point, N. J. Egg Island, N. J. Finns Point Jetty, N. J. Grubbs Landing, Del. Horseshoe Range West Group Lower Front, Pa. Maurice River Range, N. J. (2 lights). Mispillion River, Del. Salem Creek, N. J. Schuylkill River Range, Pa. (2 lights). Smyrna Range, Del. (2 lights). | 10th | Buffalo Breakwater, North End, N. Y. (temporary). Chaumont Harbor, N. Y. Cherry Island, N. Y. Cleveland East Breakwater Pierhead, Ohio. Cleveland East Breakwater West End, Ohio. Cleveland East Pier, Ohio. Cleveland West Breakwater East End, Ohio. Cleveland West Pier, Ohio. Fairport West Breakwater Pierhead, Ohio. Fairport West Pier, Ohio. Lorain East Breakwater Pierhead, Ohio. Lorain West Breakwater Pierhead, Ohio. |
| 5th | Alligator River, N. C. Cutoff Channel Range, Md. (2 lights). Fishing Point, Outer, Va. Fort McHenry, Md. Reeds Hammock, N. C. Bald Head, N. C. | 11th | Niagara River Range, N. Y. (2 lights). South Buffalo Pierhead, N. Y. Strawberry Island Lower Cut Range, N. Y. (2 lights). Strawberry Island Upper Cut Range, N. Y. (2 lights). Wells Island, N. Y. Au Sable Pierhead, Mich. Grand Island, Harbor Range, Mich. (2 lights). Gull Rock, Mich. Harbor Beach Harbor of Refuge East Entrance South, Mich. Isle aux Peches Range Rear, Mich. Isle Royal, Mich. Livingstone Channel, Nos. 2, 4, 6, 7, 8, and 10, Mich. (6 lights). Portage River Pierhead, Mich. Port Wing, East Breakwater, Mich. Sturgeon Point, Mich. Superior Entry Inner North Breakwater, Wis. |
| 6th | Bloody Point Range, Ga. (2 lights). Cape Fear River, N. C. (14 lights). Jones Island Range, Ga. (2 lights). New Channel Range Front, N. C. Paris Island Range Front, S. C. Tybee Range Front, Ga. Winyah Bay South Jetty, S. C. | 12th | Superior Entry North Breakwater, Wis. Superior Entry Inner South Pierhead, Mich. Bank Point, Mich. Chicago Breakwater North, Ill. Elbow, Wis. Frankfort South Pierhead, Mich. Grand Haven North Pierhead, Mich. Holland Range Front, Mich. Indiana Harbor Range, Ind. (2 lights). Kenosha Breakwater, Wis. Kewaunee North Pierhead, Wis. Ludington North Breakwater, Mich. Ludington South Breakwater, Mich. Manitowoc South Breakwater, Wis. Michigan City Breakwater, Mich. Milwaukee Breakwater, Wis. Milwaukee South Pierhead, Wis. Petoskey, Mich. Racine Pierhead, Wis. Saugatuck South Pierhead, Mich. Saunders Point, Mich. Sheboygan Breakwater, Wis. Waukegan Breakwater, Wis. |
| 7th | Cut J Range, Fla. (2 lights). Mangrove Point, Fla. Northwest Bar, Fla. Northwest Passage, Fla. Peace Creek, Fla. Tortugas Harbor, Fla. Wichacochee River, Fla. Caucus Cut and Pensacola Bay Rear Fla. | 16th | Battery Point, Alaska. Beanciere Island, Alaska. Blank Island, Alaska. Busby Island, Alaska. Bushy Island, Alaska. Caines Head, Alaska. Cape Chacon, Alaska. Cape Fanshaw, Alaska. Cape St. Elias, Alaska. Cape Spencer, Alaska. Cape Stephens, Alaska. Cape Strait, Alaska. |
| 8th | Cutoff Channel, Ala. (2 lights). Cutoff Channel Range, Ala. (2 lights). East Bank, Tex. Galveston Bay Channel, Nos. 1, 3, 4, and 6, Tex. (4 lights). Galveston Dike, West End, Tex. Galveston Jetty, Tex. Galveston North Jetty, Tex. Hitchcock Reef, Tex. Mobile Ship Channel, Ala. (1½ lights) Port Arthur Canal, Tex. Port Bolivar Range, Tex. (2 lights). Sabine Pass Channel, La. Sabine Pass Entrance and Inner Ranges, La. (4 lights). Sand Island Range Rear (twin), Ala. (2 lights). Seabrook, Tex. Second Turn, Tex. | | |

LIGHTED AIDS, EXCLUSIVE OF LIGHTED BUOYS, IN COMMISSION ON JUNE 30, 1914,
USING ILLUMINANTS OTHER THAN LIQUID OIL—Continued.

ACETYLENE LIGHTS—Continued.

| District. | Location. | District. | Location. |
|-----------|---|-----------|---|
| 16th..... | Channel Island, Tongass Narrows, Alaska. Channel Island, Orca Bay, Alaska. Dewey Rocks, Alaska. East Clump, Alaska. Eye-Opener, Alaska. Fairway Island, Alaska. Grave Point, Alaska. Guard Islands, Alaska. Hog Rocks, Alaska. Johnstone Point, Alaska. Key Reef, Alaska. Lincoln Rock, Alaska. Lone Tree Point, Alaska. Lord Rocks, Alaska. Mellen Rock, Alaska. Middle Rock, Alaska. Midway Islands, Alaska. Midway Rock, Alaska. Mitkof Island, Alaska. Ocean Cape, Alaska. Petersburg Float, Alaska. Pilot Rock, Alaska. Point Arden, Alaska. Point Ellis, Alaska. Point Elrington, Alaska. Point Gardner, Alaska. Point Helen, Alaska. Point Hugh, Alaska. Point Retreat, Alaska. Point Sherman, Alaska. Point Young, Alaska. Rocky Island, Alaska. Seal Island, Alaska. Shakan Bay, Alaska. Shelter Island, Alaska. Ship Island, Alaska. Smith Island, Alaska. Spanish Island, Alaska. | 16th..... | Spire Island Reef, Alaska. Strait Island, Alaska. Stikine Strait, Alaska. Sukoi Islets, Alaska. Tenakee Inlet, Alaska. Turnabout Island, Alaska. Vank Island, Alaska. Vichniski Rock, Alaska. Warburton Island, Alaska. Whale Island, Alaska. Windy Bay, Alaska. Woody Island, Alaska. |
| | | 17th..... | Columbia River Entrance Range, Oreg. Wash. (2 lights). Lime Kiln, Wash. Marrowstone Point, Wash. Neah Bay, Wash. Peapod Rocks, Wash. Viti Rocks, Wash. |
| | | 18th..... | Anacapa Island, Cal. Ballast Point, Cal. La Playa, Cal. Light No. 5, Cal. Redding Rock, Cal. Richardson Rock, Cal. San Diego Entrance Range, Cal. (2 lights). |
| | | 19th..... | Hanapepe, Hawaii. Hawea Point, Hawaii. Kahala Point, Hawaii. Kahului Breakwater, Hawaii. Kaula Head, Hawaii. Kaunakakai Range, Hawaii (2 lights). Kukuihaele, Hawaii. Laau Point, Hawaii. Lae o Kokole, Hawaii. Molokini, Hawaii. Pauwulu Point, Hawaii |

ELECTRIC ARC LIGHTS (7 LIGHTS).

| | | | |
|----------|-------------------------------------|-----------|---|
| 1st..... | Kennebunkport Pier, Me. (no lens). | 17th..... | Astoria Range, Oreg. (2 lights; no lens). |
| 3d..... | Ambrose Channel Light Vessel, N. Y. | 18th..... | Alcatraz Island, Cal. |
| | Navesink, N. J. | 19th..... | Waialeale, Hawaii (no lens). |

ELECTRIC INCANDESCENT LIGHTS (33 LIGHTS).

| | | | |
|-----------|--|-----------|--|
| 2d..... | Gallups Island, Mass. | 12th..... | Charlevoix North Pierhead, Mich. |
| 3d..... | Nantucket Shoals Light Vessel, Mass. | | Pescanaba, Mich. |
| | Aunt Phebe Rock, N. Y. | 17th..... | Manistique East Breakwater, Mich. |
| | Blackwells Island Reef, N. Y. | | Coquille River Entrance Range, Oreg. |
| | Fire Island Light Vessel, N. Y. | | (2 lights; no lens). |
| | Goat Island Shoal, R. I. | | Coquille Upper Channel Range, Oreg. (2 lights; no lens). |
| | Overfalls Light Vessel, Del. | | Point Hudson, Wash. |
| 5th..... | Rush Bluff Light Vessel, Va. | | Smith Point, Oreg. (no lens). |
| | Diamond Shoal Light Vessel, N. C. | | Tacoma Waterway, Wash. |
| 7th..... | Key West Main Ship Channel Range, Fla. (2 lights). | | Whetcom Waterway, Wash. |
| 11th..... | Alpena, Mich. | 18th..... | Immigration Station, Cal. |
| | Duluth North Pier, Mich. | | Mare Island Dike, 4, 8, 14, Cal. (3 lights; no lens). |
| | Marquette Breakwater, Mich. | | San Francisco Light Vessel, Cal. |
| | Vidal Shoals Channel Range, Mich. (2 lights). | | Bronsons Wharf, Cal. |

LIGHTED AIDS, EXCLUSIVE OF LIGHTED BUOYS, IN COMMISSION ON JUNE 30, 1914,
USING ILLUMINANTS OTHER THAN LIQUID OIL—Continued.

GAS LIGHTS (77 LIGHTS).

| District. | Location. | District. | Location. |
|-----------|--|------------|---|
| 2d..... | Newburyport Upper Harbor Range, Mass. (2 lights; coal gas). | 11th | Pilgrim Point, Mich. (oil gas). |
| 2d..... | Scotland Light Vessel, N. J. (oil gas). | | Portage Lake Ship Canals, East Breakwater, Mich. (oil gas). |
| 5th..... | Currituck Sound, N. C. (4 lights; oil gas). | | Portage Lake Ship Canals, West Breakwater, Mich. (oil gas). |
| | North Landing River, N. C. (5 lights; oil gas). | | St. Clair Flats Canal East Pierhead, Mich. (oil gas). |
| | North River, N. C. (4 lights; oil gas). | | St. Marys River, Mich. (45 lights; oil gas). |
| 6th..... | Main Channel Range Rear (St. Philippe Church), S. C. (coal gas). | | Two Harbors Breakwater, Minn. (oil gas). |
| 11th..... | Brush Point Range, Mich. (2 lights; oil gas). | 12th..... | Chicago Breakwater South, Ill. (oil gas). |
| | Forse Range Rear, Mich. (oil gas). | | Chicago Outer Breakwater, Northwest End, Ill. (oil gas). |
| | Grand Marais West Breakwater, Minn. (oil gas). | | Dunlap Reef Range Front, Wis. (oil gas). |
| | Grosse Isle South Channel Range, Mich. (2 lights; oil gas). | | North Point (Milwaukee), Wis. (coal gas). |

LIGHTS ESTABLISHED DURING THE FISCAL YEAR 1914.

'399 lights.]

| District. | Location. | Order. |
|-----------|--|---------------------------|
| 2d..... | Bass River West Jetty, Mass. | Lens lantern (acetylene). |
| | Bryant Point, Mass. | Minor. |
| | Gallups Island, Mass. | Lens lantern (electric). |
| | Long Basin, Mass. | Minor. |
| | Sutton Hole, Mass. | Do. |
| | White Head, Mass. | Do. |
| 3d..... | Aunt Phebe Rock, N. Y. | Lens lantern (acetylene). |
| | Centerville, N. J. | Do. |
| | Great Kills, N. J. | Do. |
| | Junction, N. J. | Do. |
| | Kelsey Point Breakwater, Conn. | Minor. |
| | Pamrappo, N. J. | Lens lantern (acetylene). |
| | Saltersville, N. J. | Do. |
| | Sandy Point Breakwater, Conn. | Do. |
| 4th..... | Biles Island Range, N. J. (2 lights) | Minor. |
| | Bordentown Range, N. J. (2 lights) | Do. |
| | Dennis Creek Range, N. J. (2 lights) | Do. |
| | Duck Island Range, N. J. (2 lights) | Do. |
| | Little River Range, N. J. (2 lights) | Do. |
| | Trenton Range Rear, N. J. | Do. |
| 5th..... | Blackwalnut Point Shoal, Md. | Minor (acetylene). |
| | Chadwick Point Shoal, N. C. | Minor. |
| | Dividing Creek, Va. | Do. |
| | Fishing Point Outer, Va. | Minor (acetylene). |
| | Fort McHenry, Md. | Lens lantern (acetylene). |
| | Hills Creek, N. C. | Minor. |
| | Jordan Point Range Front, Va. | Lens lantern. |
| | Mikes Sand, Va. | Minor. |
| | Roane Point, Va. | Do. |
| | Running Channel, Va. | Do. |
| | Sand Shoal Inlet Range, Va. (2 lights) | Lens lantern. |
| | Swashway, Va. | Minor. |
| | The Spit, Va. | Do. |
| | Turn of Sargent, Va. | Do. |
| 6th..... | Big Island Channel Lower Range, N. C. (2 lights) | Do. |
| | Big Island Channel Upper Range Rear, N. C. | Do. |
| | Cedar Hammock Range, Ga. (2 lights) | Reflector. |
| | Clarks Island Range, N. C. (2 lights) | Minor. |
| | Eagle Island, N. C. | Do. |
| | Fourth Eastern Jetty Range (2 lights), N. C. | Do. |
| | Keg Island Channel Upper Range Rear, N. C. | Do. |
| | Orton Cove Upper Range Rear, N. C. | Lens lantern (acetylene). |
| | North River, Fla. | Minor. |
| | Shipyard Creek, No. 5A, S. C. | Do. |
| | Turtle River Lower Range, Ga. (2 lights) | Reflector. |
| | Turtle River Upper Range, Ga. (2 lights) | Lens lantern. |
| | Upper Brunswick Channel Range, Ga. (2 lights) | Minor. |
| 7th..... | Anclote River, Nos. 6, 7, 14, 9, 11, Fla. (5 lights) | Do. |
| | Cuts A and B Ranges, Fla. (3 lights) | Do. |
| | Cut J Range, Fla. (2 lights) | Lens lantern (acetylene). |
| | Hillsboro Bay, Fla. | Lens lantern. |
| | Little Manatee River, Fla. | Minor. |

LIGHTS ESTABLISHED DURING THE FISCAL YEAR 1914—Continued.

| District. | Location. | Order. |
|-----------|--|---------------------------|
| 8th..... | Bayou Boutte, La..... | Minor. |
| | Bayou Perot, La..... | Do. |
| | Bayou Regault, La..... | Do. |
| | Blackwater Bay Channel Range, Fla. (2 lights)..... | Lens lantern. |
| | Bunch Timber Range, Fla. (2 lights)..... | Minor. |
| | Carrabelle River Entrance, No. 2, Fla..... | Do. |
| | Circle Crossing Range, Fla. (2 lights)..... | Do. |
| | East Bay Channel Range, Fla. (2 lights)..... | Lens lantern. |
| | Franks Crossing, La..... | Minor. |
| | Galveston Bay Channel, No. 6, Tex..... | Lens lantern (acetylene). |
| | Grand Lake East, La..... | Lens lantern. |
| | Hog Island, La..... | Minor. |
| | Lake Chicot South, La..... | Do. |
| | Oliver Point, Tex..... | Do. |
| | Picayune Bayou, La..... | Do. |
| | Seabrook, Tex..... | Minor (acetylene). |
| | Shell Island, La..... | Minor. |
| | Shields Point, Fla..... | Do. |
| | Stouts Point, La..... | Do. |
| | Turtle Cove Channel, Nos. 1, 3, Tex. (2 lights)..... | Lens lantern. |
| | Turtle Cove Channel Range, Tex. (2 lights)..... | Do. |
| | Vermilion Bay, La..... | Do. |
| | White Lake East and West, La. (2 lights)..... | Do. |
| | Bird Island Pier, No. 13, N. Y..... | Do. |
| | Buoy Lights Nos. 6, 7, 8, 9, 11, 15, 17, 19, 21, 23 (10 lights)..... | Do. |
| | Maumee Crib, Ohio (4 lights)..... | Minor. |
| | State Breakwater, No. 4, N. Y..... | Lens lantern. |
| | | Do. |
| 11th..... | Ashland Breakwater Pierhead, Mich..... | |
| | Johnson Point, Mich..... | Lens lantern (oil gas). |
| | Port Wing East Breakwater, Wis..... | Lens lantern (acetylene). |
| 12th..... | Recors Point, Mich..... | Lens lantern (oil gas). |
| | Superior Entry Inner South Pierhead, Wis..... | Lens lantern (acetylene). |
| | Charlevoix North Pierhead, Mich..... | Lens lantern (electric). |
| | Kewaunee North Pierhead, Wis..... | Lens lantern (acetylene). |
| | Manistique East Breakwater, Mich..... | Lens lantern (electric). |
| 13th..... | Saunders Point, Mich..... | Minor (acetylene). |
| | 27 minor lights..... | |
| 14th..... | 124 lighted spar buoys..... | |
| 15th..... | 12 minor lights..... | |
| 16th..... | 71 minor lights..... | |
| 17th..... | Caines Head, Alaska..... | Lens lantern (acetylene). |
| | Cape St. Elias, Alaska..... | Do. |
| | Cape Spencer, Alaska..... | Lens lantern. |
| | Fire Island, Alaska..... | Minor. |
| | Johnstone Point, Alaska..... | Lens lantern (acetylene). |
| | Kake Harbor, Alaska..... | Minor. |
| | Murder Cove, Alaska..... | Do. |
| | Pilot Rock, Alaska..... | Lens lantern (acetylene). |
| | Point Ellis, Alaska..... | Do. |
| | Point Elrington, Alaska..... | Do. |
| | Port Walter, Alaska..... | Do. |
| | Smith Island, Alaska..... | Do. |
| | Smugglers Cove, Alaska..... | Minor. |
| | Susitna River Range Rear, Alaska..... | Do. |
| | Woody Bay, Alaska..... | Lens lantern (acetylene). |
| | Ben Ure Island, Wash..... | Do. |
| | Bayocean Channel, Oreg..... | Minor. |
| | Dobelbower, Oreg..... | Do. |
| | Glasgow Wharf and North Bend Ranges Rear, Oreg..... | Do. |
| | Hope Island, Wash..... | Do. |
| 18th..... | Hunters Bar, Oreg..... | Do. |
| | Jarvis Lower Range Rear, Oreg..... | Do. |
| | Lime Kiln, Wash..... | Do. |
| | Price Island, Wash..... | Lens lantern (acetylene). |
| | Puget Island North, Wash..... | Minor. |
| | Sandy Island, Oreg..... | Do. |
| | Slaughter Upper Range Rear, Wash..... | Do. |
| | Walker Island Dike, Oreg..... | Do. |
| | Whatcom Waterway, Wash..... | Do. |
| | Arcata Channel, Nos. 5, 12, 9, Cal. (3 lights)..... | Do. |
| | Arcata Wharf, Cal..... | Do. |
| | Redding Rock, Cal..... | Lens lantern (acetylene). |
| | San Diego Entrance Range, Cal. (2 lights)..... | Do. |

LIGHTS WHERE ILLUMINATION WAS IMPROVED DURING THE FISCAL YEAR 1914.

FLASHING OR OCCULTING LIGHTS CHANGED FROM FIXED LIGHTS (67 LIGHTS).

| District. | Location. | District. | Location. |
|-----------|---|-----------|--|
| 2d..... | Black Marsh Channel, Mass. Black Rocks, Mass. Nantucket East Breakwater, Mass. Sandy Point, Mass. Upper Turn, Mass. White Rocks, Mass. | 9th..... | Point Jiguero, P. R. |
| 3d..... | Mill Rock Southerly, N. Y. | 11th..... | Grand Island Harbor Range, Mich. (2 lights). |
| 5th..... | Shinnecock Bay, N. Y. | | Isle Royal, Mich. |
| 6th..... | Cape Lookout, N. C. | 12th..... | Pilgrim Point, Mich. |
| | Cutoff Channel Range, Md. (2 lights). | | St. Marys River, Mich. (30 lights). |
| | Bald Head, N. C. | 17th..... | Chicago Breakwater North, Ill. |
| | Battery Island, 2A, N. C. | | Cape Blanco, Oreg. |
| | Fort Caswell Range Front, N. C. | | Cape Flattery, Wash. |
| | New Channel Range Front, N. C. | | Ediz Hook, Wash. |
| | Paris Island Range Front, S. C. | | Marrowstone Point, Wash. |
| 7th..... | Mangrove Point, Fla. | | New Dungeness, Wash. |
| | Northwest Bar, Fla. | | North Head, Wash. |
| | Northwest Passage, Fla. | | Point Hudson, Wash. |
| | Peace Creek, Fla. | | Semiamoo Harbor, Wash. |
| | Withlacoochee River, Fla. | 19th..... | Whatcom Waterway, Wash. |
| | | | Kauiki Head, Hawaii. |

INCANDESCENT OIL-VAPOR LIGHTS CHANGED FROM OIL-WICK LIGHTS (37 LIGHTS).

| | | | |
|----------|---|-----------|--|
| 1st..... | Boon Island, Me. Mount Desert, Me. Saddleback Ledge, Me. Boston, Mass. | 9th..... | Culebrita Island, P. R. |
| 2d..... | Duxbury Pier, Mass. | | Muertos Island, P. R. |
| | Long Island Head, Mass. | | Point Jiguero, P. R. |
| | Tarpaulin Cove, Mass. | 11th..... | Point Tuna, P. R. |
| 4th..... | Brandywine Shoal, Del. | | Port San Juan, P. R. |
| | Mahon River, Del. | | Au Sable, Mich. |
| | New Castle Range Rear, Del. | | Big Bay Point, Mich. |
| 5th..... | Cove Point, Md. | | Detroit River, Mich. |
| | Wolf Trap, Va. | | Duluth Range Rear, Mich. |
| 6th..... | Georgetown, S. C. | | Harbor Beach Harbor of Refuge East Entrance North, Mich. |
| | Sapelo, Ga. | | Passage Island, Mich. |
| 8th..... | Pensacola, Fla. | | Pointe aux Barques, Mich. |
| | Ship Shoal, La. | | Stannard Rock, Mich. |
| 9th..... | Arecibo, P. R. | 12th..... | Whitefish Point, Mich. |
| | Cape Rojo, P. R. | | Old Mackinac Point, Mich. |
| | Cape San Juan, P. R. | | Point Betsie, Mich. |
| | | 17th..... | Ediz Hook, Wash. |
| | | 18th..... | Trinidad Head, Cal. |

ACETYLENE OR OTHER LIGHTS CHANGED FROM OIL-WICK LIGHTS, ETC. (73 LIGHTS).

| | | | |
|----------|---|-----------|---|
| 2d..... | Black Marsh Channel, Mass. Black Rocks, Mass. Nantucket East Breakwater, Mass. Sandy Point, Mass. Upper Turn, Mass. White Rocks, Mass. | 7th..... | Withlacoochee River, Fla. |
| 3d..... | Mill Rock Southerly, N. Y. | 11th..... | Brush Point Range, Mich. (2 lights, incandescent oil-gas changed from oil-wick lights). |
| 5th..... | Cutoff Channel Range, Md. (2 lights). | | Grand Island Harbor Range, Mich. (2 lights). |
| 6th..... | Bald Head, N. C. | | Isle Royal, Mich. |
| | Cape Fear River, N. C. (2 lights). | 12th..... | Pilgrim Point, Mich. (incandescent oil-gas changed from oil-wick light). |
| | New Channel Range Front, N. C. | | St. Marys River, Mich. (45 lights, incandescent oil-gas changed from oil-wick lights). |
| | Paris Island Range Front, S. C. | | Chicago Breakwater North, Ill. |
| 7th..... | Mangrove Point, Fla. | 17th..... | Marrowstone Point, Wash. |
| | Northwest Bar, Fla. | 19th..... | Kauiki Head, Hawaii. |
| | Northwest Passage, Fla. | | |
| | Peace Creek, Fla. | | |

LIGHTS DISCONTINUED DURING THE FISCAL YEAR 1914.

[157 lights, including float lights.]

| District. | Location. | Order. |
|-----------|---|---------------------------|
| 2d..... | Bass River, Mass. | Fifth. |
| | Nantucket Breakwater, West Mass. | Lens lantern. |
| | South Boston Range, Mass. (2 lights) | Reflector (electric). |
| | Spectacle Island Range, Mass. (2 lights) | Reflector. |
| | Wamsutta Mill, Mass. | Electric. |
| 3d..... | Block Island Breakwater Inner Basin, R. I. | Lens lantern (acetylene). |
| | Centerville, N. J. | Minor. |
| | New Baltimore Rock, N. Y. | Do. |
| | Passaic, N. J. | Fourth. |
| 4th..... | Biles Island, N. J. | Minor. |
| | Bordentown, N. J. | Do. |
| | Christiana South Jetty, Del. | Lens lantern (acetylene). |
| | Duck Island, N. J. | Minor. |
| 5th..... | Bogue Sound, N. C. | Do. |
| | Harrison Bar Range Rear, Va. | Lens lantern. |
| | Target Wreck, Md. | Minor. |
| 6th..... | Alligator Creek, No. 17, N. C. | Do. |
| | Campbell Island, No. 7, N. C. | Do. |
| | Clarks Island, No. 15, N. C. | Do. |
| | Colonels Island Range, Ga. (3 lights) | Reflector. |
| | Cumming Point Range, S. C. (2 lights) | Do. |
| | First Western Jetty, No. 11, N. C. | Minor. |
| | Fourth Eastern Jetty, No. 8, N. C. | Do. |
| | Hospital Point, No. 10, N. C. | Do. |
| | Logs and Big Island Channel, No. 9, N. C. | Do. |
| | Orton Cove Range Front, No. 20, N. C. | Do. |
| | Orton Cove Range Rear, No. 3, N. C. | Do. |
| | Orton Point, No. 5, N. C. | Do. |
| | Smith Island Range, N. C. (2 lights) | Lens lantern |
| 7th..... | South Cut Lower, No. 6, Fla. | Do. |
| 8th..... | Chicot Pass North and South, La. (2 lights) | Minor. |
| | Escribano Point, Fla. | Lens lantern |
| | Middle, Fla. | Do. |
| | Rabbit Island, La. | Minor. |
| | Turning Point, La. | Do. |
| 10th..... | Oak Orchard, N. Y. | Lens lantern. |
| 13th..... | 11 minor lights | |
| | 38 lighted spar buoys | |
| 14th..... | 11 minor lights | |
| 15th..... | 48 minor lights | |
| 16th..... | Gedney Island, Alaska | Minor. |
| | Zaikof Point, Alaska | Lens lantern (acetylene). |
| 17th..... | Cowlitz River, Oreg. | Minor. |
| | Sand Island, Oreg. | Do. |
| | Skamokawa Slough Upper, Wash. | Do. |
| 18th..... | Light, No. 2, Cal. | Lens lantern. |
| | San Diego Entrance Range Front, Cal. | Do. |

LIGHTS, EXCLUSIVE OF LIGHTED BUOYS, WHICH WILL PROBABLY BE ESTABLISHED DURING THE FISCAL YEAR 1915.

| District. | Location. | Probable date of establishment. | Order. | Illuminant. | Additional keepers or laborers required. |
|-----------|--------------------------------|---------------------------------|-------------------|------------------------|--|
| 1st..... | Clarks Ledge, Me. | Sept., 1914 | Lens lantern. | Acetylene.... | 0 |
| | Fort Scammel Point, Me. | do. | do. | do. | 0 |
| | Stockton Harbor, Me. | do. | do. | do. | 0 |
| 2d..... | Deacons Pond West Jetty, Mass. | July, 1914 | Post lantern | do. | 0 |
| 3d..... | Mattituck, N. Y. | Nov., 1914 | Lens lantern | do. | 0 |
| | Rondout, N. Y. | June, 1915 | Sixth order | Oil wick. | 0 |
| | Sayville, N. Y. | Oct., 1914 | Lens lantern | Electric incandescent. | 0 |
| | Tuckerton, N. J. | | Post lantern (2). | Oil wick. | 1 |
| 4th..... | Deadman Shoal, N. J. | | Post lantern | Acetylene.... | 0 |
| | Salem Creek Range Rear, N. J. | Sept., 1914 | Lens lantern | do. | 0 |
| 5th..... | Battle Creek Shoal, Md. | Aug., 1914 | Minor | do. | 0 |
| | Chincoteague Bay, Va. | Nov., 1914 | do. | Oil. | 0 |
| | Gulford Flats, Va. | Aug., 1914 | do. | Acetylene.... | 0 |
| | Hack Neck Shoal, Va. | do. | do. | do. | 0 |

LIGHTS, EXCLUSIVE OF LIGHTED BUOYS, WHICH WILL PROBABLY BE ESTABLISHED DURING THE FISCAL YEAR 1915—Continued.

| District. | Location. | Probable date of establishment. | Order. | Illuminant. | Additional keepers or laborers required. |
|-----------|---|---------------------------------|-------------------|----------------------------|--|
| 5th..... | Inner Middle Ground, N. C..... | Aug. 1914 | Minor..... | Acetylene..... | 0 |
| | Jarvis Point Shoal, Va..... | do..... | do..... | do..... | 0 |
| | Manokin River, Md..... | do..... | do..... | do..... | 0 |
| | Petersons Point, Md..... | do..... | do..... | do..... | 0 |
| | Pooles Island Range, Md..... | Sept., 1914 | do..... | Oil..... | 1 |
| | St. Pierre Island, Md..... | Aug., 1914 | do..... | Acetylene..... | 1 |
| 6th..... | Fort Sumter Range Front, S. C..... | Mar., 1915 | Range lens..... | do..... | 0 |
| | Brickyard Creek, No. 1, S. C..... | Jan., 1915 | Post lantern..... | do..... | 0 |
| | Dawho River, No. 3, S. C..... | do..... | do..... | do..... | 0 |
| | Dawho River, No. 4, S. C..... | do..... | do..... | do..... | 0 |
| | Old Fernandina, Fla..... | Oct., 1914 | do..... | Oil..... | 0 |
| | Satilla River Lights, Nos. 1, 2, 3, 4, 5, Ga..... | May, 1915 | do..... | do..... | 1 |
| | Quarantine Light, Fla..... | Oct., 1914 | do..... | do..... | 0 |
| 7th..... | Cut D Range, Tampa Bay, Fla..... | June, 1915 | Lens lantern..... | Acetylene..... | 0 |
| | Cut G Range, Tampa Bay Fla..... | Oct., 1914 | do..... | Oil..... | 0 |
| | Cut K Range, Tampa Bay, Fla..... | do..... | do..... | do..... | 0 |
| | Eastern Triangle, Fla..... | Nov., 1914 | Minor..... | Acetylene..... | 0 |
| | Egmont Key Range Front, Fla..... | Aug., 1914 | Lens lantern..... | do..... | 0 |
| | Matanzas Pass, Fla..... | Sept., 1914 | Minor..... | Oil..... | 1 |
| | Pine Island Sound Nos. 4, 8, 14, 3, 9, 15, Fla..... | do..... | Minor (6)..... | do..... | 1 |
| | North Bank, Fla..... | Feb., 1915 | Lens lantern..... | Acetylene..... | 0 |
| 8th..... | Galveston Bay Channel Entrance Range, Tex..... | Nov., 1914 | Lens lantern..... | do..... | 0 |
| | Galveston Bay Channel, Nos. 3A, 2A, 4A, Tex..... | do..... | Lens lantern..... | do..... | 0 |
| | Pass aux Herons, Ala., Nos. 2, 4, 6, 8..... | Oct., 1914 | Lens lantern..... | Oil..... | 1 |
| 9th..... | Puntilla Point..... | Jan., 1915 | Lens lantern..... | Electric incandescent..... | 1 |
| | Anegado Shoal Range..... | Feb., 1915 | Lens lantern..... | Acetylene..... | 1 |
| | Catano Range Front..... | do..... | Lens lantern..... | do..... | 0 |
| 10th..... | Ashtabula East Breakwater, Ohio..... | July, 1914 | do..... | do..... | 0 |
| | Ashtabula West Breakwater, Ohio..... | do..... | do..... | do..... | 0 |
| | Ballast Island, Ohio..... | June, 1915 | do..... | do..... | 1 |
| | Buffalo South Pier, N. Y..... | Aug., 1914 | do..... | Electric incandescent..... | 0 |
| | Conneaut East Pier, Ohio..... | Oct., 1914 | do..... | Oil..... | 0 |
| | Linda Island, N. Y..... | June, 1915 | do..... | Acetylene..... | 0 |
| 11th..... | Ashland Breakwater, Wis..... | Apr., 1915 | Fourth order..... | Electric..... | 1 |
| | Livingstone Channel, Mich..... | do..... | Lens lantern..... | Acetylene..... | 0 |
| 12th..... | Muskegon North Pierhead, Mich..... | Sept., 1914 | do..... | do..... | 0 |
| | Manistique East Breakwater, Mich..... | Apr., 1915 | Fourth order..... | Electric incandescent..... | 2 |
| | Manistique West Breakwater, Mich..... | do..... | Lens lantern..... | Acetylene..... | 0 |
| | Manistique West Pierhead, Mich..... | Oct., 1914 | Post lantern..... | Oil..... | 0 |
| | Oconto Harbor South Pierhead, Wis..... | do..... | Lens lantern..... | Acetylene..... | 0 |
| | Saugatuck North Pierhead, Mich..... | Sept., 1914 | Fifth order..... | do..... | 0 |
| 16th..... | Blunt Point Reef, Alaska..... | Oct., 1914 | Post lantern..... | Oil..... | 0 |
| | Gambier Entrance Reef, Alaska..... | do..... | do..... | do..... | 0 |
| | Little Island, Alaska..... | do..... | Lens lantern..... | Acetylene..... | 0 |
| | Naked Island, Alaska..... | do..... | do..... | do..... | 0 |
| | Narrow Point, Alaska..... | Sept., 1914 | do..... | do..... | 0 |
| | Ostola Island, Alaska..... | do..... | do..... | do..... | 0 |
| | Point Alexander, Alaska..... | do..... | do..... | do..... | 0 |
| | Sheep Creek, Alaska..... | do..... | Post lantern..... | do..... | 0 |
| | South Flat North End, Alaska..... | Oct., 1914 | do..... | Oil..... | 0 |
| 17th..... | Prairie Channel, Oreg..... | do..... | do..... | do..... | 0 |
| | Turn Rock, Wash..... | Nov., 1914 | Lens lantern..... | Acetylene..... | 1 |
| 18th..... | Blunt Point, Cal..... | Dec., 1914 | do..... | do..... | 0 |
| | Point Stuart, Cal..... | do..... | do..... | do..... | 0 |
| | San Antonio Creek, Cal..... | Oct., 1914 | do..... | Oil..... | 0 |
| 19th..... | Kipahulu, Hawaii..... | June, 1915 | do..... | Acetylene..... | 0 |
| | Kukui Point, Hawaii..... | do..... | Post lantern..... | do..... | 0 |

GAS BUOYS ESTABLISHED AND DISCONTINUED DURING THE FISCAL YEAR 1914.

| District. | Location. | District. | Location. |
|-----------|--|-----------|--|
| | ESTABLISHED (91). | | ESTABLISHED (91)—Continued. |
| 2d..... | Mishaum Ledge, 3, Mass. | 10th..... | Conneaut West Breakwater, 2, Ohio. |
| | North Channel, 2, 3, 4, 8, 10 (1 has bell) | | Ogdensburg East Entrance, 1, N. Y. |
| | Mass. | | Outer, 1, Pa. |
| 3d..... | Plymouth Main Channel, 3, Mass. | 11th..... | Chas. S. Price wreck, Mich. |
| | Bridgeport Harbor, 2 (bell), Conn. | | Lake St. Clair, 20A, Mich. (bell). |
| | Charlemagne Tower, Jr., wreck, N. J. | | Livingstone Channel (4), Mich. |
| | Coal barge wreck, N. J. | | Vidal Shoals Junction, Mich. |
| | Coal barge wreck, N. Y. | 12th..... | Boulder Reef (whistling), Mich. |
| | Florence Russel wreck, Conn. | | Sleeping Bear, 7, Mich. |
| | McCries Shoal, 2 (whistling), N. J. | | Waukegan Shoals, 3, Ill. |
| | Nassau Point, 14, N. Y. | 17th..... | Astoria Harbor, 11, Oreg. |
| | Orellana wreck, N. J. | | Clatsop Spit, 12 (bell), Oreg. |
| | Shag Bank, 5, Conn. | | Point Partridge, 2 (bell), Wash. |
| | Teaser wreck, N. J. | 18th..... | Cortes Bank, 2CB (whistling), Cal. |
| | Wreck, N. Y. | | Point Delgada, 4 (whistling), Cal. |
| 4th..... | Joe Flogger Shoal, 11 A (bell), Del. | | Duxbury Reef, 1DR (whistling), Cal. |
| | Schooner Ledge Range, 2 S, N. J. | | San Pablo Dredged Channel, 5, Cal. |
| | Tinicum Island Range, 2 T, N. J. | | San Pablo Dredged Channel, 1, 9 (bell) |
| 5th..... | Black Fish Bank, 4 (whistling), Va. | | Cal. |
| | Brewerton Channel, 1B, 12B, Md. | | J. H. Lunsmann wreck, 4 (bell), Cal. |
| | Cambridge Channel, 2 (bell), Md. | | Port Harford, 3 (whistling), Cal. |
| | Craighill Channel, 5C, 6C, 9C, 10C (1 has | 19th..... | Peninsula Point, 1 (bell), Cal. |
| | bell), Md. | | Channel, 9, Hawaii. |
| | Cutoff Entrance, 2K, Cutoff Channel, | | DISCONTINUED (27). |
| | 3K, 8K, 9K, 11K, Md. | 2d..... | Boston Main Channel, 7, 8, Mass. |
| | Dom Pedro II wreck, Va. | | Falcon wreck, Mass. |
| | Fort McHenry Channel, 2M, 3M, 5M, | | Mishaum Ledge, 3 (bell), Mass. |
| | 6M, 7M, 8M, 9M, 10M, Md. | 3d..... | Coal barge wreck, N. Y. |
| | Horseshoe Shoal, 2, Va. | | Florence Russel wreck, Conn. |
| | Little Gull Bank, 2 (whistling), Md. | | Orellana wreck, N. J. |
| | Monroe wreck, Va. | | Party Bar, 3, Conn. |
| | Sewall Point Shoal, 3 (bell), Va. | | Wreck, N. Y. |
| | Tolly Point Shoal, 31, Md. | 5th..... | Alum Chine wreck, Va. |
| 6th..... | Bloody Point Channel, 2, 13 (1 has bell), | | Bangor wreck, A, B (2), Va. |
| | Ga. | | Dom Pedro II, wreck, Va. |
| | Charleston, 1 (bell), S. C. | | Florida wreck, Va. |
| 7th..... | Combahee Bank, 2A, S. C. | | Julia Luckenbach wreck, Va. |
| | Biscayne Shoal, 2 (bell), Fla. | | Monroe wreck, Va. |
| | Channel, 2J, Fla. | | Rosalie D'Ali wreck, Va. |
| | Molasses Reef, 2M, Fla. | | Sewall Point Shoal, 3, Va. |
| | Port Inglis, 1 (whistling), Fla. | 10th..... | Ogdensburg East Entrance, 2, N. Y. |
| 8th..... | Whitehead Point Spit, 6, Fla. | 11th..... | Gros Cap Reef 18 (bell), Mich. |
| | Cape San Blas Outer Shoals, 30 (bell), | | Johnson Point, 5, Mich. |
| | Fla. | | Vidal Shoals Channel, 2, Mich. |
| | Dixie Island, 2A, Ala. | 12th..... | Boulder Reef, Mich. |
| | Galveston North Channel, 2, 4, Tex. | 18th..... | Lower Mid-Channel, 4 (bell), Cal. |
| | Knoll, 2, Ala. | | J. H. Lunsmann wreck, 4 (bell), Cal. |
| 9th..... | Cabeza de Perro, 1, P. R. | | Inside Bar, 2A (whistling), Cal. |
| 10th..... | Buffalo Light Vessel Station, N. Y. | 19th..... | Channel, 10, Hawaii. |
| | Buffalo Light Vessel Wreck, N. Y. | | |
| | Channel, 3, N. Y. | | |

FOG SIGNALS ESTABLISHED, IMPROVED, AND DISCONTINUED DURING THE FISCAL YEAR 1914.

| District. | Location. | Character. |
|-----------|---------------------------------|-------------------------------|
| | ESTABLISHED (4). | |
| 1st..... | Fiddlers Reach, Me. | Bell struck by machinery. |
| 3d..... | Aunt Phebe Rock, N. Y. | Bell operated by electricity. |
| | Sandy Point Breakwater, Conn. | Bell operated by electricity. |
| 17th..... | Whatcom Waterway, Wash. | Horn operated by electricity. |
| | IMPROVED (4). | |
| 4th..... | Mish Maull Shoal, N. J. | From— |
| 12th..... | South Haven, Mich. | Hand horn. |
| | | To— |
| 17th..... | Point Wilson, Wash. | 2d-class reed horn. |
| 18th..... | St. George Reef, Cal. | Bell operated by electricity. |
| | | 1st-class air siren. |
| | | 1st-class air siren. |
| | DISCONTINUED (3). | |
| 3d..... | Passaic, N. J. | Bell struck by machinery. |
| 10th..... | Buffalo Light Vessel, 82, N. Y. | 10-inch steam whistle. |
| 11th..... | Alpena, Mich. | Bell struck by machinery. |

FOG SIGNALS WHICH WILL PROBABLY BE ESTABLISHED DURING THE FISCAL YEAR 1915.

| District. | Location. | Character. |
|-----------|---------------------------------------|--|
| 2d..... | Gallups Island, Mass..... | Bell operated by electricity. |
| 3d..... | Rondout, N. Y..... | Bell struck by machinery. |
| 5th..... | Fort McHenry, Md..... | Gong operated by electricity. |
| 8th..... | Galveston Jetty, Tex..... | Siren. |
| | Point au Fer Reef, La..... | Bell struck by machinery. |
| 10th..... | Buffalo Light Vessel, N. Y..... | Siren. |
| | Buffalo, N. Y..... | Diaphone. |
| 12th..... | Manistique East Breakwater, Mich..... | Siren. |
| 18th..... | Blunt Point, Cal..... | Bell or siren operated by electricity. |
| | Point Stuart, Cal..... | Do. |

Light vessel No. 82, stationed at Buffalo, N. Y., was discontinued during the fiscal year 1914. Light vessel No. 98 will probably be established on this station during 1915.

SUBMARINE SIGNALS ESTABLISHED AND DISCONTINUED DURING THE FISCAL YEAR 1914.

| District. | Location. | District. | Location. |
|-----------|--|-----------|--|
| | ESTABLISHED (3). | | ESTABLISHED (3)—continued. |
| 1st..... | Manana Island Gas, Whistling, and Submarine Bell Buoy, 14M, Me. (operated by action of sea). | 6th..... | St. Johns Gas, Whistling, and Submarine Bell Buoy, St. J., Fla. (operated by action of sea). |
| 3d..... | Point Judith Gas, Whistling, and Submarine Bell Buoy, 2, R. I. (operated by action of sea). | | DISCONTINUED (1). |
| | | 10th..... | Buffalo Light Vessel No. 82, N. Y. |

SUBMARINE SIGNALS IN COMMISSION ON JUNE 30, 1914.

[Unless otherwise stated, these signals are operated by compressed air (48 signals).]

| District. | Location. | District. | Location. |
|-----------|--|-----------|---|
| 1st..... | Manana Island Gas, Whistling, and Submarine Bell Buoy, 14M, Me. (operated by action of sea). | 5th..... | 35-Foot Channel Light Vessel No. 45, Va. Winter-Quarter Shoal Light Vessel No. 91, Va. |
| | Portland Light Vessel No. 74, Me. | 6th..... | Brunswick Light Vessel No. 84, Ga. |
| 2d..... | Boston Light Vessel No. 84, Mass. | | Frying-Pan Shoals Light Vessel No. 94, N. C. |
| | Great Round Shoal Light Vessel No. 86, Mass. | | Martins Industry Light Vessel No. 1, S. C. |
| | Hedge Fence Light Vessel No. 41, Mass. | | St. Johns Gas, Whistling, and Submarine Bell Buoy, St. J., Fla. (operated by action of sea). |
| | Nantucket Shoals Light Vessel No. 85, Mass. | 8th..... | Heald Bank Light Vessel No. 81, Tex. |
| | Pollock Rip Light Vessel No. 47, Mass. | | Southwest Pass Light Vessel No. 43, La. |
| | Pollock Rip Blue Light Vessel No. 73, Mass. | 11th..... | Bar Point Shoal Light Vessel No. 62, Mich. |
| | Vineyard Sound Light Vessel No. 90, Mass. | | Detour Light Station, Mich. (operated electrically from the shore). |
| | Peaked Hill Submarine Bell Buoy, 2A, Mass. (operated by action of sea). | | Lake Huron Light Vessel No. 61, Mich. |
| 3d..... | Ambrose Channel Light Vessel No. 87, N. Y. | | Poe Reef Light Vessel No. 59, Mich. |
| | Barnegat Shoal Gas, Whistling, and Submarine Bell Buoy, 7B, N. Y. (operated by action of sea). | | Whitfish Point Light Station, Mich. (operated electrically from the shore). |
| | Brenton Reef Light Vessel No. 39, R. I. | 12th..... | Eleven-Foot Shoal Light Vessel No. 60, Mich. |
| | Cornfield Light Vessel No. 48, Conn. | | Grays Reef Light Vessel No. 57, Mich. |
| | Fire Island Light Vessel No. 68, N. Y. | | Lansing Shoal Light Vessel No. 55, Mich. |
| | Five-Fathom Bank Light Vessel No. 79, N. J. | | North Manitou Shoal Light Vessel No. 56, Mich. |
| | Northeast End Light Vessel No. 44, N. J. | | White Shoal Light Station, Mich. (operated electrically from lighthouse). |
| | Overfalls Light Vessel No. 69, Del. | 17th..... | Columbia River Light Vessel No. 88, Oreg. |
| | Point Judith Gas, Whistling, and Submarine Bell Buoy, 2, R. I. (operated by action of sea). | | Orford Reef Gas, Whistling, and Submarine Bell Buoy, 2 OR, Oreg. (operated by action of the sea). |
| 5th..... | Cape Charles Light Vessel No. 49, Va. | | Swiftsure Bank Light Vessel No. 93, Wash. |
| | Cape Lookout Shoals Light Vessel No. 80, N. C. | | Umatilla Reef Light Vessel No. 67, Wash. |
| | Diamond Shoal Light Vessel No. 71, N. C. | 18th..... | Blunts Reef Light Vessel No. 83, Cal. |
| | Fenwick Island Light Vessel No. 52, Del. | | San Francisco Light Vessel No. 70, Ca. |
| | Tail of the Horseshoe Light Vessel No. 46, Va. | | |

PRIVATE AIDS TO NAVIGATION MAINTAINED ON JUNE 30, 1914.

[Under the act of June 20, 1906.]

| District. | Lights. | Buoys. | | Other unlighted aids. | Fog signals. | Total. |
|------------|---------|----------|------------|-----------------------|--------------|--------|
| | | Lighted. | Unlighted. | | | |
| 1st..... | | | 33 | 3 | | 36 |
| 2d..... | 35 | 7 | 25 | 16 | 1 | 84 |
| 3d..... | 32 | | 43 | 2 | 2 | 79 |
| 5th..... | 9 | | 56 | 48 | 2 | 115 |
| 6th..... | 2 | 6 | 5 | 15 | | 28 |
| 7th..... | | | | 34 | | 34 |
| 8th..... | 12 | | 5 | 13 | | 30 |
| 9th..... | | | 1 | | | 1 |
| 10th..... | 28 | 8 | 7 | | 3 | 46 |
| 11th..... | 6 | 6 | 60 | 1 | | 73 |
| 12th..... | 30 | 1 | 8 | | 6 | 45 |
| 13th..... | | 1 | | | | 1 |
| 16th..... | 1 | | 4 | 3 | | 8 |
| 17th..... | 3 | | 12 | | 2 | 17 |
| 18th..... | 19 | 13 | | | 8 | 40 |
| 19th..... | 18 | 1 | | 2 | | 21 |
| Total..... | 196 | 43 | 259 | 137 | 24 | 658 |

BRIDGES OVER NAVIGABLE WATERS LIGHTED ON JUNE 30, 1914.

[Under the act of Aug. 7, 1882, 22 Stat., 309.]

| District. | Lighted bridges. | District. | Lighted bridges. | District. | Lighted bridges. |
|-----------|------------------|-----------|------------------|------------|------------------|
| 1st..... | 2 | 8th..... | 4 | 15th..... | 7 |
| 2d..... | 33 | 9th..... | | 16th..... | |
| 3d..... | 35 | 10th..... | 48 | 17th..... | 44 |
| 4th..... | 11 | 11th..... | 53 | 18th..... | 7 |
| 5th..... | 25 | 12th..... | 113 | 19th..... | |
| 6th..... | 52 | 13th..... | 76 | | |
| 7th..... | 7 | 14th..... | 172 | Total..... | 689 |

AIDS MAINTAINED UNDER CONTRACT DURING THE FISCAL YEAR 1914.

| District. | Name of aids. | Annual cost. |
|-----------|---|--------------|
| 5th..... | Sand Shoal Inlet, Fishermans Inlet, and Magothy Bay, Va. (buoys and stakes).... | \$100.00 |
| 6th..... | Little River Inlet, N. C. (4 bar buoys)..... | 1.00 |
| 10th..... | Lake Ontario and the St. Lawrence River, N. Y. (36 buoys)..... | 1,800.00 |
| | Niagara River, N. Y. (45 buoys)..... | 300.00 |
| 11th..... | Superior Bay, St. Louis Bay and River, Wis. and Minn. (32 lights)..... | 1,300.00 |
| 12th..... | Fox River, Wis. (12 spar buoys); Green Bay, Wis. (16 spar buoys)..... | 160.00 |
| 16th..... | Cooks Inlet, Alaska (post lights)..... | 140.00 |
| | St. Michaels Canal and Apoon Pass, Alaska (15 keg and 15 barrel buoys)..... | 380.50 |
| | Orizaba Reef Bell Buoy..... | 90.00 |
| 18th..... | Hookton Channel Range Rear Light, Cal..... | 1.00 |
| 19th..... | Lahaina Buoy Light, Hawaii..... | 1.00 |

LIGHT VESSELS IN COMMISSION DURING THE FISCAL YEAR 1914.

| Number. | Station. | District. | Tonnage. | | When built. | Material of hull. | Dimensions. | | | Indicated horsepower (self-propelling). | Regular complement. | | Fog signal. | Illuminant. | Cost of repairs made during fiscal year. | Cost of maintenance during fiscal year. | Original cost. | On station. | |
|---------|-------------------------------|-----------|----------|------|-------------|-------------------|------------------|-----------------|-----------------|---|---------------------|-------|----------------------------|-------------|--|---|----------------|-------------|-------|
| | | | Gross. | Net. | | | Length over all. | Breadth. | Depth. | | Others. | Crew. | | | | | | Months. | Days. |
| 74 | Portland, Me. | 1 | 496 | | 1902 | Wood. | Ft. in. 129 9 | Ft. in. 28 6 | Ft. in. 13 0 | 380 | 4 | 8 | 12" steam whistle b. | Acet. | \$3,557 | \$10,507 | \$88,986 | 12 | ... |
| 3 | Shovelbu Shoal, Mass. | 2 | 140 | | 1832 | do. | 69 4 | 23 0 | 10 0 | ... | 2 | 5 | Bell or horn. | Oil. | 738 | 4,389 | 12,000 | 12 | ... |
| 4 | Handkerchief, Mass. | 2 | 104 | | 1855 | do. | 77 0 | 20 0 | 10 0 | ... | 2 | 5 | do. | do. | 6,185 | 4,315 | ... | 6 | 20 |
| 5 | Cross Rip, Mass. | 2 | 104 | | 1864 | do. | 80 0 | 21 6 | 9 0 | ... | 2 | 5 | 8" air whistle. | do. | 1,118 | 6,759 | ... | 10 | 21 |
| 6 | Relief. | 2 | 120 | | 1864 | do. | 80 0 | 21 6 | 9 0 | ... | 2 | 5 | Bell. | do. | 2,478 | 910 | ... | 6 | ... |
| 9 | do. | 2 | 104 | | 1857 | do. | 81 2 | 28 2 | 9 6 | ... | 1 | 1 | 8" air whistle. | do. | 1,379 | 2,223 | 19,883 | 3 | 11 |
| 41 | Hedge Fence Shoal, Mass. | 2 | 387 | | 1876 | do. | 120 6 | 26 9 | 11 0 | ... | 2 | 6 | First-class air siren b. | do. | 13,336 | 6,863 | 33,000 | 12 | ... |
| 42 | Hend Chikens Shoal, Mass. | 2 | 410 | | 1877 | do. | 121 7 | 26 6 | 10 6 | ... | 2 | 6 | 10" air whistle. | do. | 109 | 6,900 | 40,796 | 11 | 7 |
| 47 | Pollock Rip, Mass. | 2 | 470 | | 1891 | Comp. | 120 10 | 26 6 | 11 0 | 135 | 4 | 6 | 12" steam whistle b. | do. | 197 | 7,644 | 60,000 | 12 | ... |
| 48 | Boston, Mass. | 2 | 310 | | 1892 | Steel. | 118 10 | 26 6 | 13 0 | 350 | 4 | 8 | 12" steam whistle b. | do. | 9,086 | 8,688 | 62,080 | 1 | 25 |
| 66 | Relief. | 2 | 590 | | 1896 | Comp. | 123 0 | 28 6 | 13 0 | 400 | 2 | 4 | 12" steam whistle b. | do. | 840 | 7,381 | 69,282 | 10 | 20 |
| 67 | Pollock Rip Shoal, Mass. | 2 | 538 | | 1901 | Steel. | 123 9 | 28 6 | 12 9 | 400 | 4 | 8 | do. | Oil. or o. | 603 | 10,076 | 76,872 | 12 | ... |
| 68 | Hend Chikens Shoal, Mass. | 2 | 683 | | 1907 | do. | 135 5 | 29 0 | 13 0 | 380 | 4 | 8 | 12" steam whistle b. | El. inc. | 726 | 13,106 | 99,000 | 11 | 16 |
| 85 | Nantucket Shoals, Mass. | 2 | 683 | | 1907 | do. | 135 5 | 29 0 | 13 0 | 380 | 4 | 8 | do. | Oil. | 637 | 10,483 | 99,000 | 10 | 22 |
| 90 | Vineyard Sound, Mass. | 2 | 685 | | 1908 | do. | 135 5 | 29 6 | 13 0 | 400 | 4 | 8 | 12" steam whistle b. | do. | 517 | 9,753 | 107,213 | 12 | ... |
| 11 | Scotland, N. J. | 3 | 320 | | 1833 | Wood. | 104 8 | 24 8 | 11 6 | ... | 2 | 6 | Bell. | Oil gas. | 1,140 | 5,492 | 13,462 | 10 | 13 |
| 12 | Bartlett Reef, Conn. | 3 | 155 | | 1854 | do. | 79 8 | 21 8 | 10 4 | ... | 2 | 6 | do. | Oil. | 1,163 | 5,865 | 12,000 | 11 | 5 |
| 13 | Relief. | 3 | 250 | | 1854 | do. | 103 6 | 22 6 | 11 0 | ... | 0 | 1 | First-class air siren b. | do. | 3,475 | 1,288 | 28,084 | 6 | 16 |
| 16 | do. | 3 | 165 | | 1867 | do. | 81 6 | 21 6 | 10 0 | ... | 0 | 1 | Bell. | do. | 34 | 826 | 26,040 | 0 | 0 |
| 20 | Ram Island Reef, N. Y. | 3 | 186 | | 1857 | do. | 94 2 | 24 0 | 9 0 | ... | 2 | 5 | do. | do. | 514 | 4,770 | 7,500 | 12 | ... |
| 23 | Brenton Reef, R. I. | 3 | 387 | | 1875 | do. | 115 6 | 26 9 | 13 0 | ... | 2 | 6 | 12" and 6" steam wh. b. | do. | 1,486 | 8,451 | 42,200 | 18 | 16 |
| 44 | Cornfield Point, Conn. | 3 | 470 | | 1893 | Iron. | 120 10 | 27 8 | 12 0 | ... | 3 | 7 | First-class steam siren b. | Acet. | 867 | 9,120 | 50,000 | 10 | 19 |
| 51 | Relief. | 3 | 283 | | 1892 | Steel. | 118 10 | 26 6 | 12 6 | 135 | 2 | 5 | First-class air siren b. | do. | 2,228 | 8,667 | 62,780 | 11 | 20 |
| 61 | Fire Island, N. Y. | 3 | 590 | | 1897 | Comp. | 122 10 | 28 6 | 12 6 | 350 | 4 | 8 | 12" steam whistle b. | El. inc. | 1,564 | 12,409 | 83,325 | 7 | 5 |
| 69 | Overalls, Del. | 3 | 590 | | 1897 | Comp. | 122 10 | 28 6 | 12 6 | 350 | 4 | 8 | 12" steam whistle b. | do. | 2,037 | 12,845 | 74,750 | 10 | 28 |
| 79 | Five-Fathom Bank, N. J. | 3 | 683 | | 1904 | Steel. | 129 0 | 28 6 | 12 6 | 325 | 4 | 8 | do. | do. | 5,326 | 10,846 | 99,000 | 8 | 15 |
| 87 | Ambrose Channel, N. Y. | 3 | 683 | | 1907 | do. | 135 5 | 29 0 | 13 0 | 325 | 4 | 8 | 12" steam whistle b. | El. arc. | 2,185 | 13,191 | 99,000 | 10 | 25 |
| 45 | Relief. | 5 | 210 | | 1849 | Wood. | 68 0 | 25 0 | 9 0 | ... | 1 | 6 | Bell. | Oil. | 107 | 6,367 | 12,402 | 11 | 24 |
| 46 | Thirty-Five Foot Channel, Va. | 5 | 401 | | 1857 | Steel. | 124 6 | 27 6 | 12 0 | ... | 2 | 6 | 8" air whistle b. | do. | 265 | 7,457 | 38,500 | 7 | 4 |
| 46 | Tail of the Horsehoe, Va. | 5 | 401 | | 1857 | do. | 124 6 | 27 6 | 12 0 | ... | 2 | 6 | 12" steam whistle b. | do. | 10,590 | 1,335 | 60,000 | 6 | 19 |

| | | | | | | | | | | | | | | | | | | | | |
|----|----------------------------|----|-----|------|--------|--------|-------|----|----|----|-----|-----|------------------------|------------------------|------------|--------|---------|---------|----|----|
| 49 | Cape Charles, Va. | 5 | 470 | 1890 | Comp. | 120 10 | 27 | 0 | 14 | 0 | 4 | 6 | do. b. | do. | 7,344 | 9,516 | 57,900 | 10 | 25 | |
| 50 | Patuxent Shoal, Del. | 5 | 416 | 1892 | Steel. | 118 10 | 28 | 6 | 12 | 0 | 5 | 10 | 1st-class air siren b. | do. | 8,181 | 10,820 | 62,000 | 6 | 6 | |
| 51 | Danvers Shoal, N. C. | 5 | 550 | 1892 | Comp. | 122 10 | 28 | 6 | 14 | 0 | 350 | 2 | 12" steam chime wh. b. | El. Inc. | 1,724 | 14,015 | 70,700 | 12 | 6 | |
| 52 | Relief c. | 5 | 663 | 1890 | Steel. | 120 | 28 | 6 | 12 | 0 | 350 | 2 | do. do. | do. | 9,026 | 8,990 | 89,000 | 6 | 6 | |
| 53 | Relief c. | 5 | 663 | 1894 | do. | 120 | 28 | 6 | 12 | 0 | 325 | 5 | 12" steam whistle b. | Oil | 6,988 | 5,340 | 89,080 | 2 | 24 | |
| 54 | Cape Lookout Shoals, N. C. | 5 | 668 | 1894 | do. | 120 | 28 | 6 | 12 | 0 | 500 | 4 | 12" steam chime wh. b. | do. | 2,372 | 11,270 | 85,000 | 12 | 8 | |
| 55 | Walter-Carter Shoals, Va. | 5 | 685 | 1896 | do. | 120 | 28 | 6 | 12 | 0 | 400 | 4 | 8" steam chime wh. b. | do. | 4,601 | 10,154 | 107,213 | 8 | 19 | |
| 56 | Bush Bluff, Va. | 5 | 67 | 1876 | Comp. | 80 | 6 | 19 | 5 | 12 | 0 | 1 | Bell | El. Inc. | 840 | 2,285 | 107,213 | 12 | 12 | |
| 57 | Martins Industry, S. C. | 6 | 275 | 1855 | Wood. | 108 | 0 | 24 | 0 | 13 | 0 | 3 | 12" steam whistle b. | Oil | 755 | 7,189 | 2,199 | 5 | 8 | |
| 58 | Relief | 6 | 232 | 1864 | do. | 101 | 0 | 23 | 0 | 10 | 6 | 2 | Bell | do. | 235 | 2,219 | 2,219 | 5 | 27 | |
| 59 | Charleston, S. C. | 6 | 160 | 1864 | do. | 101 | 10 | 23 | 0 | 10 | 0 | 2 | 8" air chime whistle. | do. | 80 | 5,963 | 48,000 | 12 | 12 | |
| 60 | Relief c. | 6 | 310 | 1892 | Steel. | 119 | 0 | 26 | 6 | 11 | 0 | 135 | 5 | 12" steam whistle b. | Acet. | 40,285 | 8,373 | 61,536 | 6 | 23 |
| 61 | Brunswick, Ga. | 6 | 653 | 1907 | do. | 135 | 5 | 29 | 0 | 13 | 0 | 325 | 4 | do. b. | Oil | 1,627 | 11,586 | 99,000 | 10 | 23 |
| 62 | Frying Pan Shoals, N. C. | 6 | 670 | 1911 | do. | 135 | 5 | 29 | 0 | 13 | 0 | 363 | 4 | 12" steam chime wh. b. | Inc. O. V. | 1,042 | 12,503 | 104,604 | 12 | 12 |
| 63 | Southwest Pass, La. | 8 | 191 | 1881 | Comp. | 118 | 0 | 25 | 0 | 12 | 0 | 4 | 12" steam whistle b. | Oil | 3,963 | 8,505 | 50,000 | 9 | 22 | |
| 64 | Heald Bank, Tex. | 8 | 685 | 1904 | Steel. | 120 | 0 | 28 | 6 | 12 | 6 | 325 | 4 | do. b. | do. | 2,961 | 10,374 | 90,000 | 6 | 20 |
| 65 | Buffalo, N. Y. | 10 | 187 | 1912 | do. | 95 | 2 | 21 | 0 | 8 | 11 | 90 | 10" | steam whistle b. | do. | 55 | 4,356 | 42,910 | 4 | 10 |
| 66 | Poe Reef, Mich. | 11 | 105 | 1893 | Wood | 87 | 2 | 21 | 6 | 9 | 6 | 3 | 6" steam whistle b. | do. | 798 | 4,414 | 25,000 | 7 | 17 | |
| 67 | Lake Huron, Mich. | 11 | 105 | 1893 | do. | 87 | 2 | 21 | 0 | 9 | 0 | 3 | do. b. | do. | 1,185 | 4,567 | 14,086 | 7 | 24 | |
| 68 | Bar Point Shoal, Mich. | 11 | 105 | 1893 | do. | 87 | 2 | 21 | 6 | 8 | 0 | 3 | do. b. | do. | 1,180 | 4,560 | 14,086 | 8 | 4 | |
| 69 | Lake St. Clair, Mich. | 11 | 160 | 1902 | Steel | 83 | 9 | 24 | 0 | 4 | 9 | 2 | Bell | do. | 1,361 | 3,226 | 14,963 | 7 | 28 | |
| 70 | Martin Reef, Mich. | 11 | 205 | 1908 | do. | 88 | 3 | 21 | 0 | 10 | 0 | 90 | 4 | 6" steam whistle | do. | 892 | 5,191 | 87,500 | 7 | 10 |
| 71 | Lausling Shoal, Mich. | 12 | 129 | 1891 | Wood | 102 | 8 | 20 | 0 | 9 | 0 | 100 | 4 | 6" steam whistle b. | do. | 966 | 5,569 | 13,600 | 7 | 10 |
| 72 | North Manitou Shoal, Mich. | 12 | 130 | 1891 | do. | 102 | 8 | 20 | 0 | 8 | 10 | 100 | 4 | do. b. | do. | 1,06 | 5,423 | 13,600 | 7 | 15 |
| 73 | Grays Reef, Mich. | 12 | 130 | 1891 | do. | 102 | 8 | 20 | 0 | 8 | 10 | 100 | 4 | do. b. | do. | 793 | 5,355 | 13,600 | 7 | 11 |
| 74 | Eleven-Foot Shoal, Mich. | 12 | 105 | 1893 | do. | 87 | 2 | 21 | 6 | 8 | 6 | 3 | do. b. | do. | 2,599 | 4,416 | 13,990 | 7 | 12 | |
| 75 | Peshigo Reef, Wis. | 12 | 155 | 1906 | Steel | 75 | 0 | 21 | 6 | 4 | 0 | 2 | 8" air chime whistle. | do. | 766 | 3,648 | 13,950 | 7 | 7 | |
| 76 | Milwaukee, Wis. | 12 | 368 | 1912 | do. | 108 | 5 | 23 | 0 | 10 | 2 | 200 | 4 | 12" steam whistle. | do. | 794 | 8,123 | 74,558 | 8 | 13 |
| 77 | Laid out at Astoria, Ore. | 17 | 470 | 1892 | Comp. | 120 10 | 26 | 9 | 11 | 3 | 200 | 4 | do. | do. | 16 | 1,647 | 61,150 | 0 | 0 | |
| 78 | Umatilla Reef, Wash. | 17 | 450 | 1897 | do. | 122 7 | 28 | 6 | 13 | 0 | 200 | 4 | 12" steam chime wh. b. | do. | 203 | 13,990 | 69,750 | 11 | 1 | |
| 79 | Columbia River, Ore. | 17 | 683 | 1907 | Steel. | 135 5 | 29 | 0 | 13 | 0 | 325 | 4 | 10" steam whistle b. | do. | 1,253 | 14,209 | 99,000 | 11 | 14 | |
| 80 | Relief | 17 | 685 | 225 | 1908 | do. | 135 5 | 29 | 0 | 13 | 0 | 400 | 2 | do. b. | do. | 1,765 | 10,713 | 107,213 | 3 | 21 |
| 81 | Swiftness Bank, Wash. | 17 | 685 | 225 | 1908 | do. | 135 5 | 29 | 0 | 13 | 0 | 400 | 4 | do. b. | do. | 1,536 | 15,518 | 107,213 | 10 | 6 |
| 82 | San Francisco, Cal. | 18 | 590 | 1897 | Comp. | 122 10 | 28 | 6 | 13 | 0 | 300 | 4 | do. b. | El. Inc. | 2,166 | 18,233 | 79,000 | 11 | 24 | |
| 83 | Relief. | 18 | 578 | 1894 | Steel. | 120 6 | 28 | 8 | 12 | 0 | 400 | 2 | do. b. | Oil | 2,957 | 7,492 | 90,000 | 1 | 5 | |
| 84 | Blunts Reef, Cal. | 18 | 668 | 1904 | do. | 120 0 | 28 | 6 | 13 | 0 | 380 | 4 | do. b. | do. | 4,657 | 15,561 | 90,000 | 11 | 2 | |

^a Displacement.
^b Submarine signal.
^c Equipped with radio.
^d Wood sheathed.

^e Length between perpendiculars.
^f Lost Nov. 10, 1913.

TENDERS OF THE LIGHTHOUSE SERVICE IN COMMISSION DURING THE FISCAL YEAR 1914.

| Name. | District. | Tonnage. | | When built. | Description. | Material of hull. | Dimensions. | | | Draft. | | Indicated horsepower. | Regular complement. | | Miles steamed. | Coal consumed for all purposes. | Cost of repairs. | Cost of maintenance. | Original cost. |
|-------------------|-----------|----------|-------|-------------|--------------------------|-------------------|------------------|----------|---------|---------|---------|-----------------------|---------------------|-------|----------------|---------------------------------|------------------|----------------------|----------------|
| | | Gross. | Net. | | | | Length over all. | Breadth. | Depth. | Light. | Loaded. | | Officers. | Crew. | | | | | |
| Hibiscus..... | 1 | a 1,053 | b 803 | 1908 | Steamer, screw..... | Steel..... | Foot 190 | Foot 30 | Foot 16 | Foot 13 | Foot 13 | 1,000 | 6 | 23 | 14,065 | Tons 1,937 | 3,692 | 24,751 | 1184,643 |
| Zinnia..... | 1 | a 417 | b 331 | 1888 | do..... | do..... | 161 | 27 | 12 | 9 | 10 | 650 | 6 | 19 | 10,748 | 1,508 | 1,784 | 26,966 | 48,739 |
| Anemone..... | 2 | a 1,053 | b 803 | 1908 | do..... | do..... | 190 | 30 | 16 | 13 | 14 | 1,000 | 7 | 23 | 13,812 | 2,188 | 1,981 | 35,681 | 191,999 |
| Azalea..... | 2 | a 600 | b 423 | 1891 | do..... | do..... | 154 | 25 | 12 | 8 | 10 | 400 | 5 | 19 | 11,285 | 909 | 1,235 | 24,114 | 79,792 |
| Mayflower..... | 2 | a 668 | b 563 | 1897 | do..... | do..... | 164 | 30 | 12 | 9 | 8 | 650 | 5 | 22 | 10,280 | 1,712 | 3,528 | 30,787 | 74,872 |
| Daisy..... | 3 | 35 | 12 | 1862 | do..... | Wood..... | 80 | 14 | 5 | 5 | 6 | 80 | 2 | 4 | 7,780 | 143 | 1,515 | 6,654 | 6,500 |
| Gardenia..... | 3 | 150 | 83 | 1879 | do..... | do..... | 117 | 20 | 9 | 9 | 8 | 200 | 4 | 11 | 9,659 | 418 | 1,638 | 14,052 | 11,001 |
| John Rodgers..... | 3 | 260 | 155 | 1883 | Steamer, side-wheel..... | Iron..... | 160 | 27 | 9 | 7 | 8 | 280 | 4 | 16 | 7,021 | 830 | 2,196 | 20,514 | 59,987 |
| Larkspur..... | 3 | 685 | b 703 | 1903 | Steamer, screw..... | Steel..... | 166 | 30 | 14 | 9 | 11 | 750 | 6 | 22 | 13,313 | 1,909 | 1,964 | 30,075 | 123,253 |
| Mistletoe..... | 3 | 352 | 176 | 1872 | Steamer, side-wheel..... | Wood..... | 180 | 28 | 9 | 7 | 8 | 370 | 4 | 16 | 6,901 | 644 | 1,508 | 18,685 | 45,739 |
| Pansy..... | 3 | 314 | 157 | 1878 | Steamer, screw..... | Iron..... | 152 | 25 | 11 | 7 | 9 | 250 | 4 | 17 | 13,940 | 41 | 13,940 | 18,456 | 45,739 |
| Tulip..... | 3 | a 1,053 | b 803 | 1908 | do..... | Steel..... | 190 | 30 | 16 | 12 | 13 | 1,000 | 7 | 24 | 19,185 | 2,326 | 3,286 | 36,006 | 101,668 |
| Irish..... | 4 | 428 | 262 | 1897 | do..... | do..... | 153 | 30 | 10 | 9 | 10 | 800 | 4 | 19 | 14,784 | 1,477 | 1,788 | 25,431 | 54,407 |
| Holly..... | 5 | 367 | 142 | 1881 | Steamer, side-wheel..... | Comp..... | 176 | 24 | 10 | 7 | 8 | 400 | 5 | 16 | 8,163 | 798 | 784 | 20,137 | 41,911 |
| Ivy..... | 5 | a 915 | b 726 | 1904 | Steamer, screw..... | Steel..... | 173 | 30 | 13 | 10 | 10 | 6 | 6 | 22 | 11,738 | 1,546 | 1,441 | 33,415 | 123,890 |
| Jessamine..... | 5 | 297 | 155 | 1881 | Steamer, side-wheel..... | Iron..... | 156 | 24 | 10 | 7 | 8 | 350 | 4 | 16 | 5,827 | 626 | 7,261 | 19,468 | 41,911 |
| Juniper..... | 5 | 84 | 108 | 1903 | Steamer, screw..... | Steel..... | 95 | 18 | 8 | 4 | 5 | 290 | 2 | 5 | 6,466 | 435 | 4,900 | 4,900 | 29,425 |
| Maple..... | 5 | a 564 | b 865 | 1893 | do..... | do..... | 164 | 30 | 12 | 8 | 9 | 650 | 6 | 22 | 12,565 | 1,294 | 4,453 | 28,257 | 68,890 |
| Orchid..... | 5 | a 1,053 | b 803 | 1908 | do..... | do..... | 190 | 30 | 16 | 12 | 13 | 1,000 | 6 | 22 | 15,484 | 2,086 | 2,990 | 33,045 | 186,151 |
| Woodbine..... | 5 | a 1,053 | b 803 | 1913 | Oil screw..... | Wood..... | 95 | 16 | 7 | 5 | 6 | 125 | 2 | 4 | 6,454 | 6 | 939 | 6,550 | 24,728 |
| Cypress..... | 6 | a 1,053 | b 803 | 1908 | Steamer, screw..... | Steel..... | 190 | 30 | 16 | 11 | 13 | 1,000 | 6 | 23 | 19,854 | 3,127 | 7,907 | 40,799 | 191,633 |
| Mangrove..... | 6 | a 668 | b 593 | 1897 | do..... | do..... | 164 | 30 | 12 | 8 | 8 | 550 | 6 | 23 | 9,872 | 1,643 | 17,889 | 29,731 | 74,998 |
| Snowdrop..... | 6 | 32 | 19 | 1896 | Gasoline, screw..... | Wood..... | 69 | 11 | 5 | 3 | 4 | 32 | 2 | 2 | 9,243 | 5 | 365 | 6,319 | 9,700 |
| Water Lily..... | 6 | 33 | 19 | 1895 | do..... | do..... | 64 | 11 | 5 | 3 | 3 | 32 | 2 | 2 | 6,867 | 5 | 682 | 5,123 | 6,264 |
| Arbutus..... | 7 | 400 | 75 | 1879 | Steamer, screw..... | do..... | 153 | 25 | 11 | 8 | 9 | 380 | 6 | 19 | 2,479 | 181 | 50,591 | 6,683 | 46,709 |
| Magnolia..... | 7 | a 915 | b 736 | 1904 | do..... | Steel..... | 173 | 30 | 13 | 9 | 10 | 700 | 5 | 22 | 8,427 | 1,470 | 1,566 | 31,399 | 124,874 |

| | | | | | | | | | | | | | | | | | | | |
|----------------|--------|---------|-------|------|---------------------------|-----|----|----|----|----|----|---|-------|---|----|--------|-------|--------|---------|
| Carnelia..... | 8 | a 377 | b 276 | 1911 | do..... | 117 | 24 | 10 | 6 | 9 | 7 | 9 | 280 | 4 | 12 | 7,678 | 1,245 | 17,752 | 57,412 |
| Lilac..... | 8 | a 643 | b 464 | 1892 | do..... | 155 | 27 | 15 | 12 | 0 | 13 | 6 | 800 | 5 | 19 | 13,605 | 2,056 | 24,307 | 50,125 |
| Sunflower..... | 8 | a 988 | b 737 | 1907 | do..... | 174 | 31 | 15 | 11 | 10 | 13 | 0 | 900 | 7 | 23 | 10,649 | 5,283 | 34,236 | 124,668 |
| Myrtle..... | 9 | a 500 | 240 | 1872 | do..... | 140 | 25 | 11 | 11 | 6 | 13 | 0 | 225 | 4 | 17 | 8,997 | 221 | 13,502 | 44,500 |
| Crocus..... | 10 | a 542 | b 835 | 1904 | do..... | 165 | 29 | 14 | 10 | 0 | 11 | 0 | 700 | 6 | 21 | 7,109 | 1,499 | 28,460 | 119,718 |
| Amaranth..... | 11 | 744 | 488 | 1892 | do..... | 166 | 28 | 14 | 11 | 6 | 13 | 0 | 672 | 5 | 18 | 12,286 | 1,514 | 29,963 | 74,994 |
| Aspen..... | 11 | a 377 | b 82 | 1906 | do..... | 126 | 25 | 12 | 9 | 6 | 9 | 6 | 440 | 4 | 10 | 9,747 | 1,159 | 13,612 | 70,573 |
| Clower..... | 11 | a 96 | b 65 | 1899 | do..... | 93 | 22 | 7 | 7 | 0 | 6 | 9 | 140 | 4 | 8 | 3,805 | 159 | 8,276 | 13,800 |
| Margold..... | 11 | a 698 | b 477 | 1890 | do..... | 160 | 27 | 12 | 11 | 8 | 11 | 6 | 550 | 5 | 13 | 11,759 | 1,027 | 24,668 | 64,871 |
| Hyacinth..... | 12 | a 914 | b 493 | 1903 | do..... | 165 | 28 | 14 | 11 | 0 | 12 | 0 | 878 | 5 | 18 | 10,338 | 1,321 | 25,424 | 115,000 |
| Sunae..... | 12 | a 887 | b 600 | 1903 | do..... | 169 | 30 | 13 | 11 | 3 | 13 | 0 | 700 | 6 | 21 | 11,303 | 1,524 | 31,889 | 114,992 |
| Goldenrod..... | 13, 14 | 461 | 143 | 1888 | Steamer, stern-wheel..... | 169 | 27 | 4 | 2 | 6 | 3 | 6 | 153 | 3 | 15 | 6,223 | 880 | 17,982 | 33,221 |
| Oleander..... | 15 | a 494 | b 418 | 1903 | do..... | 189 | 34 | 7 | 4 | 6 | 4 | 6 | 600 | 3 | 15 | 12,831 | 1,797 | 24,617 | 60,000 |
| Columbine..... | 16 | a 643 | b 464 | 1892 | do..... | 155 | 27 | 15 | 11 | 6 | 13 | 0 | 800 | 6 | 19 | 15,044 | 1,571 | 40,433 | 93,983 |
| Heather..... | 17 | a 831 | b 631 | 1903 | do..... | 179 | 28 | 15 | 11 | 0 | 12 | 6 | 685 | 6 | 19 | 8,434 | 1,549 | 34,520 | 118,598 |
| Mansantha..... | 17 | a 1,053 | b 803 | 1908 | do..... | 190 | 30 | 16 | 12 | 0 | 13 | 1 | 1,000 | 6 | 23 | 10,638 | 1,846 | 40,279 | 211,817 |
| Madrono..... | 18 | a 806 | b 654 | 1885 | do..... | 180 | 27 | 15 | 12 | 6 | 12 | 0 | 750 | 6 | 19 | 12,309 | 1,245 | 33,539 | 87,872 |
| Sequoia..... | 18 | a 1,053 | b 803 | 1908 | do..... | 190 | 30 | 16 | 13 | 5 | 15 | 3 | 1,000 | 6 | 23 | 12,286 | 1,442 | 39,678 | 213,499 |
| Kukui / | 19 | a 1,053 | b 803 | 1906 | do..... | 190 | 30 | 16 | 13 | 1 | 12 | 0 | 1,000 | 6 | 22 | 7,012 | 1,047 | 44,065 | 213,880 |

a Displacement loaded.

b Displacement light.

c Length between perpendiculars.

d Also 6,700 gallons gasoline.

e Also 4,284 gallons gasoline.

f Equipped with wireless telegraph.

LIGHTHOUSE VESSELS SOLD OR TRANSFERRED DURING THE FISCAL YEAR 1914.

The wreck of the tender *Armeria* was sold on April 20, 1914, to the highest bidder for \$2,500.

CONSTRUCTION OF TENDERS AND LIGHT VESSELS.

Tender "Clover" (formerly "Two Myrtles").—This vessel was purchased in 1908 for use in connection with the construction of White Shoal Light Station, and on completion of this work was laid up at Milwaukee depot. During the previous fiscal year the vessel was fitted with a new boiler and machinery and in the past fiscal year was equipped with hoisting apparatus and completed as a small tender for general service. The vessel was assigned to the eleventh lighthouse district and reported at Detroit for duty on December 5, 1913. The repairs and alterations were made from general appropriations.

Tender "Fern."—Acts of May 27, 1908, and March 4, 1909, appropriated \$200,000 for one tender (*Aster*), and the act of July 27, 1912, authorized the use of this amount for the construction of two tenders for general service. As one of these, it is proposed to build a small tender for service in the inside waters of Alaska. Plans and specifications were issued, and on April 17, 1914, a contract was awarded for its construction to Hall Bros. Marine Railway & Shipbuilding Co., Winslow, Wash., in the sum of \$62,000. Amount expended to June 30, 1914, \$653.38.

Tender "Laurel."—Appropriation of March 4, 1907, \$60,000, for a tender for the fifteenth district (*Dandelion*); authority of act of July 27, 1912, to use this appropriation for a tender for general service. Plans were prepared for a small tender for work in the inside waters of the Atlantic coast, and on September 9, 1913, a contract was awarded for its construction to Spedden Ship Building Co., Baltimore, Md., in the sum of \$41,000. The vessel was launched on June 24, 1914. Amount expended to June 30, 1914, \$25,030.91.

Tender "Palmetto."—Appropriation of May 27, 1908, \$30,000. Owing to the rearrangement of the use of tenders, this vessel was not immediately needed, and its construction was deferred. Plans are being prepared for a light-draft tender for use in the inside waters of the sixth district. Amount expended to June 30, 1914, \$2,485.73.

Tender "Pansy."—The act of March 4, 1909, appropriated \$12,000 for repairs to the lighthouse tender *Pansy*. A new boiler has been ordered, and extensive repairs are now under way. Amount expended to June 30, 1914, \$6,536.62.

Tender "Rose."—Acts of May 27, 1908, and March 4, 1909, appropriated \$200,000 for one tender (*Aster*), and the act of July 27, 1912, authorized the use of this amount for the construction of two tenders for general service. As one of these, it is proposed to build a tender of moderate size and draft for use in the small harbors and inside waters of the coasts of Oregon and Washington. Plans and specifications are now nearly completed. Amount expended to June 30, 1914, \$593.09.

Tender "Woodbine."—Appropriation of March 4, 1907, \$25,000. This tender was placed under contract at West New Brighton, N. Y. The failure of the contractors delayed the completion of the vessel and on October 22, 1912, it was taken over by the Government under a supplemental contract and was completed by the Lighthouse Service. An internal-combustion engine using kerosene was substituted for the steam-propelling plant and the quarters generally rearranged. A 3-ton power derrick is being installed. The vessel was placed in commission on March 9, 1914, and assigned to the fifth district. Amount expended to June 30, 1914, \$24,727.85.

Light vessel "No. 96."—Appropriation of March 4, 1911, \$75,000, for a light vessel for service at or near a point between Point Abino and Sturgeon Point in Lake Erie. Plans and specifications were prepared for a nonpropelling light vessel, and contract was entered into on April 24, 1913, with the Racine-Truscott-Shell Lake Boat Co., Muskegon, Mich., for the construction of this vessel. The vessel was launched on April 21, 1914, and on June 30, 1914, the work was 96 per cent completed. The contract price is \$69,850. Amount expended to June 30, 1914, \$55,014.70.

Light vessel "No. 98."—Act of August 26, 1912, appropriated \$250,000 for light vessels for general service. As one of these, it was decided to build a duplicate of *No. 96*, the design of which was approaching completion, for service on the Lakes. Bids were received and contract was entered into on April 24, 1913, with the Racine-Truscott-Shell Lake Boat Co., Muskegon, Mich., for its construction. The vessel was launched on June 9, 1914, and on June 30, 1914, the vessel was 89 per cent completed. The contract price is \$69,850. On June 8, 1914, advertisements were issued for the purchase and installation of an internal-combustion kerosene engine. Amount expended to June 30, 1914, \$53,298.16.

Light vessel "No. 99."—Act of August 26, 1912, appropriated \$250,000 for light vessels for general service. It is proposed to build a first-class self-propelled vessel suitable for exposed Atlantic coast stations. A preliminary design has been prepared. Amount expended to June 30, 1914, \$5,144.61.

Light vessel "No. 100."—The act of August 24, 1912, appropriated \$130,000 for a light vessel for general service. It is proposed to build a large vessel that will be suitable for Nantucket or some other important exposed station. No expenditures to June 30, 1914.

Light vessel "No. 101."—Act of August 26, 1912, appropriated \$250,000 for light vessels for general service. It is proposed to build a second-class vessel for general relief duty on the Atlantic coast. Plans and specifications are nearly completed. Amount expended to June 30, 1914, \$250.

Light vessel "No. 102" (Southwest Pass).—The act of October 22, 1913, appropriated \$125,000 for a light vessel for the Southwest Pass Entrance to the Mississippi River, La. It is proposed to build a vessel generally similar to *No. 101* suitable for use on this station. Amount expended to June 30, 1914, \$150.

SPECIAL WORKS OF CONSTRUCTION COMPLETED (OMITTING VESSELS).

Oil houses for light stations.—The acts of May 27, 1908, March 4, 1909, and June 25, 1910, each appropriated \$10,000 for establishing isolated oil houses for the storage of kerosene, etc. During the fiscal year oil houses were completed at the following-named 38 stations:

| | Amount expended. | | Amount expended. |
|--------------------------------|---------------------|------------------------------|---------------------|
| Execution Rocks, N. Y..... | \$391.17 | Cardona Island, P. R..... | \$370.72 |
| West Bank, N. Y..... | 407.38 | Muertos Island, P. R..... | 420.79 |
| Old Orchard Shoal, N. Y..... | 326.31 | Jobos Harbor, P. R..... | 370.72 |
| Del. Bkw. Rge. Front, Del..... | 531.17 | Point Figuras, P. R..... | 370.72 |
| Piney Point, Md..... | 268.73 | Point Tuna, P. R..... | 420.72 |
| Blakistone Island, Md..... | 264.55 | Culebrita Island, P. R..... | 420.71 |
| Fort Washington, Md..... | 252.19 | Point Mulas, P. R..... | 370.72 |
| Turkey Point, Md..... | 246.56 | Cabras Island, P. R..... | 370.72 |
| Ocracoke, N. C..... | 361.10 | Cape San Juan, P. R..... | 420.71 |
| Fowey Rocks, Fla..... | 360.00 | Portage Lake, Mich..... | 513.97 |
| Alligator Reef, Fla..... | 360.00 | Pentwater, Mich..... | 500.46 |
| Sombrero Key, Fla..... | 360.00 | Turn Point, Wash..... | 376.80 |
| American Shoal, Fla..... | 361.54 | Robinson Point, Wash..... | 376.80 |
| Rebecca Shoal, Fla..... | 193.88 | Point Wilson, Wash..... | 376.80 |
| Arecibo, P. R..... | 430.71 | Alki Point, Wash..... | 458.26 |
| Point Borinquen, P. R..... | 420.71 | Point Hueneme, Cal..... | 527.85 |
| Mona Island, P. R..... | 420.71 | Farallon, Cal..... | 454.89 |
| Cape Rojo, P. R..... | 420.71 | Los Angeles Harbor, Cal..... | 550.00 |
| Guanica, P. R..... | 370.72 | Kauhola Point, Hawaii..... | 408.36 |

SECOND DISTRICT.

Storehouses for oil.—The act of May 27, 1908, appropriated \$3,000 for two oil houses at a cost not to exceed \$1,500 each, to be erected at such places as are considered for the best interests of the Lighthouse Service. The first oil house under this appropriation was built at Edgemoor, Del., as described in the annual report for 1913, and the second was completed at the Woods Hole Lighthouse depot, Mass., on November 29, 1913, at a cost of \$1,500. On June 30, 1914, there was an unexpended balance of \$10.98 under this appropriation.

THIRD DISTRICT.

Newark Bay, N. J.—The act of March 4, 1907, appropriated \$15,000 for a light or fog-signal station at or near the west end of the draw near the Lehigh Valley Railroad bridge across Newark Bay, N. J. The act of October 22, 1913, authorized the use of the balance of this appropriation for establishing four small flashing acetylene lights in place of one light and fog signal, the four small lights being preferred by maritime interests using this channel. The balance of the appropriation remaining unexpended at the time of this authorization was \$14,343.25. The work has been completed, and the lights went into operation on April 4, 1914. Amount expended to June 30, 1914, \$9,276.48.

Negro Point, N. Y.—The act of May 27, 1908, appropriated \$10,000 for a light and fog-signal station at or near Negro Point, on Wards Island, Hell Gate, East River, N. Y. The work has been completed, and the light and fog signal went into operation on January 20, 1913. Amount expended to June 30, 1914, \$7,028.05.

EIGHTH DISTRICT.

Sand Island Light Station, Ala.—The act of March 4, 1911, appropriated \$15,000 for protecting the site at Sand Island Light Station, Ala.; 1,687 tons of rock have been placed around the tower. The project was completed December 7, 1913, at a total cost of \$14,208.84.

NINTH DISTRICT.

San Juan, P. R.—The act of May 27, 1908, appropriated \$15,000 for a storehouse and dock at San Juan, P. R., and the act of July 27, 1912, authorized the use of the unexpended balance of this appropriation for the alteration, repair, and construction of necessary buildings, docks, and improvements of the grounds at the San Juan Lighthouse depot. During the fiscal year alterations and repairs were made to various buildings; the wharf was repaired, and quarters for employees were erected. A few improvements to the grounds remain to be completed. Amount expended to June 30, 1914, \$13,000.03.

TENTH DISTRICT.

Buffalo Breakwater, N. Y.—The act of March 4, 1911, appropriated \$60,000 for rebuilding the Buffalo Breakwater North End Light Station, N. Y. The contract work on the structure was completed April 25, 1914. The fog signal was put in commission July 15, 1914. The light apparatus will probably be in commission by August 15, 1914. Amount expended to June 30, 1914, \$53,281.71.

ELEVENTH DISTRICT.

St. Marys River, Mich.—The act of August 26, 1912, appropriated \$60,000 for repairs and improvements to aids to navigation along the St. Marys River. The original project embraced 43 lights in all, of which the illuminant was changed during the year from oil to oil gas. Two additional lights were added, making 45 in all. Concrete pier structures were built for 11 of the lights, and 7 of them were thoroughly ripped. New steel superstructures were provided in a number of cases. Forty-one of the lighting installations were completed last season and the remainder of the work was completed before June 30, 1914, except some minor adjustments of apparatus and purchase of spare equipment. Amount expended to June 30, 1914, \$56,279.68.

NINETEENTH DISTRICT.

Kauhola Point Light Station, Hawaii.—With an allotment of funds from the appropriation for light-keepers' dwellings, made by the act of May 27, 1908, a one-story frame structure, with water supply, plumbing, and drainage system, was completed for the keeper at Kauhola Point, Hawaii, on January 12, 1914. Total cost to June 30, 1914, \$2,833.43.

SPECIAL WORKS OF CONSTRUCTION UNCOMPLETED (OMITTING VESSELS).

Oil houses for light stations.—The acts of May 27, 1908, March 4, 1909, and June 25, 1910, each appropriated \$10,000 for establishing isolated oil houses for the storage of kerosene, etc. On June 30, 1914, there was an unexpended balance of \$4,334.64 under these appropriations. Work was in progress toward the construction of oil houses at the following-named stations:

| Station. | Probable date of completion. | Amount expended. | Station. | Probable date of completion. | Amount expended. |
|-----------------------------|------------------------------|------------------|---------------------------|------------------------------|------------------|
| New Haven, Conn. | July 31, 1914 | \$192.67 | Saugerties, N. Y. | July 31, 1914 | \$135.16 |
| Southwest Ledge, Conn. | Aug. 15, 1914 | 233.38 | Point Jiguero, P. R. | Dec. 31, 1914 | ..... |
| Whale Rock, R. I. | Sept. 1, 1914 | 126.04 | Kenosha, Wis. .... | ..... | ..... |

THIRD DISTRICT.

Staten Island, N. Y., and West Bank, N. J.—The acts of June 30, 1906, and March 4, 1909, each appropriated \$50,000 for a lighthouse on Staten Island, N. Y., and the raising of West Bank Light, N. J. This act of June 30, 1906, also appropriated \$10,000 for a

temporary structure to maintain West Bank Light while being raised, and a temporary structure for North Hook Light while being moved. All work except building of fence at Staten Island Light has been completed, and the new light was put into operation on April 15, 1912. It is expected that all work will be completed during the season of 1914. Amount expended to June 30, 1914, \$73,651.68.

Stonington, Conn.—The act of March 4, 1911, appropriated \$500 for the repair of the sea wall at Stonington Point, Conn. It is expected that the work will be completed about November 15, 1914. Amount expended to June 30, 1914, \$7.73.

Staten Island lighthouse depot, N. Y.—The act of March 4, 1911, appropriated \$40,000 for repair and extension of wharves at the general lighthouse depot, Staten Island, N. Y. The extending of the north wharf was completed on June 5, 1913, and repairs to the south wharf will be completed about July 15, 1914. Amount expended to June 30, 1914, \$29,269.67. The act of March 4, 1911, also appropriated \$30,000 for constructing a power house and foundry, and for completing the equipment, wiring, etc., of the power plant at the general lighthouse depot, Staten Island, N. Y. The power house, foundry building, and the installation of the machinery were all completed with the exception of part of the floors in power house. It is expected that all work will be completed during the season of 1914. Amount expended to June 30, 1914, \$29,455.29.

Rondout Creek, Hudson River, N. Y.—The act of March 4, 1911, appropriated \$40,000 for establishing a light and fog-signal station at or near the mouth of Rondout Creek, Hudson River, N. Y. The work was started in March, 1914, and it is expected will be completed about December 1, 1914. Amount expended to June 30, 1914, \$25.50.

Hunts Point, N. Y.—The act of March 4, 1911, appropriated \$5,000 for the establishment of a light and fog signal to mark Hunts Point, between Hell Gate and Whitestone Point, East River, N. Y. Steps have been taken for procuring a site for this light station from the State of New York. The matter is held in abeyance pending the determination of the extent of bulkheads and docks to be built at this point. No expenditure has been made from this appropriation, and the date of completion depends on the acquisition of a site.

FOURTH DISTRICT.

Miah Maull Shoal, N. J.—Appropriations were made by the acts of June 30, 1906 (\$40,000), March 4, 1907 (\$35,000), and March 4, 1911 (\$30,000), for a light and fog-signal station at Miah Maull Shoal, Delaware River. The foundation shell was erected at the site and partly filled with concrete in December, 1909. The superstructure was completed on February 20, 1913, and the permanent fog signal was established on December 5, 1913. The station is now completed except minor repairs to boat hoisting apparatus and seams of lantern deck which work is now in progress and will be completed in the summer of 1914. Amount expended to June 30, 1914, \$103,230.75.

Joe Flogger Shoal, Del.—The act of June 20, 1906, authorized \$75,000 for establishing a light and fog signal at or near this shoal. The act of June 30, 1906, appropriated \$40,000 for this purpose, and the act of June 17, 1910, increased the limit of cost for this light and fog signal to \$105,000. An additional appropriation has not yet been made. Work on this project has been deferred, as the total amount necessary has not been appropriated and other projects are considered of greater importance. The shoal is now marked by a gas buoy. Amount expended to June 30, 1914, \$603.21.

Brandywine Shoal, Del.—The act of March 4, 1911, appropriated \$75,000 for rebuilding and improving the present light and fog signal at Brandywine Shoal, Delaware Bay, Del., on the present or an adjacent site. The construction of a reinforced concrete lighthouse is in progress. The foundation of the lighthouse was launched at Lewes, Del., on July 10, 1913, and was towed to the site and placed on the pile foundation on August 6, 1913. On November 7, 1913, work was suspended for the winter. In May, 1914, the contractor again began operations at the site. The first floor beams and slabs were put in place and the outside circular wall was constructed up to the second floor. Probable date of completion, December, 1914. Amount expended to June 30, 1914, \$54,146.70.

FIFTH DISTRICT.

Thimble Shoal, Va.—The act of June 25, 1910, appropriated \$68,000, and the act of August 26, 1912, \$39,000 for the establishment of the light and fog-signal station at this point. During the year the metal work for the caisson was delivered and the caisson successfully completed at the site, being sunk by the compressed air process. The metal work for the superstructure has been delivered and that part up to the lantern floor erected. The lens has been ordered and bids received for the fog-signal machinery. It is expected that the station will be completed by December, 1914. Amount expended to June 30, 1914, \$52,265.47.

Norfolk Harbor, Va.—The act of March 4, 1911, appropriated \$35,000 for establishing an adequate system of lighting in the channel leading to Norfolk Harbor, Va. During the year five mantle gas buoys were placed to relieve old buoys. It is proposed to purchase some spare gas buoys for use in this channel and harbor under this appropriation. Amount expended to June 30, 1914, \$16,020.76.

Fort McHenry Channel, Md.—The act of March 4, 1911, appropriated \$125,000 for range lights in the Fort McHenry Channel, Md. Authority was given by Congress on July 27, 1912, for the use of this appropriation for the establishing of gas buoys and other aids to navigation in the channels leading to Baltimore, Md. During the year 19 gas buoys have been established, one of which was a combination gas (acetylene) and bell buoy, and also an acetylene light on a standard skeleton steel tower at Fort McHenry and the fog-signal apparatus consisting of a gong and electric striker ordered. The old oil lights with locomotive headlight reflectors on the Cutoff Channel Range were replaced by acetylene lights in range lenses. The establishment of 4 gas buoys, 16 tall-type can and nun buoys, and 1 bell buoy is contemplated. It is expected to complete the work by January 1, 1915. Amount expended to June 30, 1914, \$39,865.52.

Chesapeake Bay Entrance, Va.—The act of May 27, 1908, appropriated \$27,000 for one buoy to be placed off Cape Henry, Va., one buoy to be placed to the northward of the Middle Ground near the entrance to Chesapeake Bay, and one relief buoy. During the year arrangements were made for the purchase and installation of two submarine bells and receptacles for the same. Amount expended to June 30, 1914, \$23,240.23.

SIXTH DISTRICT.

Cape Fear River, N. C.—The act of March 4, 1911, appropriated \$21,000 and the act of August 26, 1912, appropriated \$30,000 for lights and signals in Cape Fear River below Wilmington, N. C. Ten four-pile reinforced concrete structures with pipe towers were erected and lights established December 1, 1912. A contract made on March 10, 1913, for the erection of 20 similar structures on marine site and two pipe towers on concrete piers on land was completed, and the system put into operation on November 15, 1913, making use of temporary illuminating apparatus pending the completion of 16 five-day oil-burning lens lanterns. These have now been received and will be installed during the season of 1914, when the entire project will have been completed. Bald Head Light has also been changed from oil-burning to acetylene equipment, and incorporated in the system of lighting established under these appropriations. Total amount expended under both appropriations to June 30, 1914, \$49,810.95.

Depot for sixth lighthouse district.—The act of October 23, 1914, appropriated \$125,000 for the purchase of a site and the construction of a wharf and buildings for a depot, sixth lighthouse district. A site has been selected on the mainland at Charleston, S. C., a survey made and negotiations relative to transfer of deed to the United States are under way. Plans and specifications for the completion of the depot are in course of preparation. Cost of site \$60,000. No expenditures to June 30, 1914.

EIGHTH DISTRICT.

Atchafalaya Entrance Channel, La.—The act of October 22, 1913, appropriated \$50,000 for erecting aids to navigation on the Atchafalaya Entrance Channel, La. Detailed plans and specifications are being prepared with a view to doing the work under contract. Probable date of completion, spring of 1915. At the close of the fiscal year 1914 no money had been expended or obligated.

Galveston Jetty Light Station, Tex.—The act of June 11, 1896, appropriated \$35,000, and the act of May 27, 1908, \$10,000 for establishing a light and fog signal at or near the outer end of one of the jetties at Galveston Harbor, Tex., and for changing the characteristics of Bolivar Point Light Station at the entrance to said harbor. On June 30, 1914, nine iron foundation piles had been driven, the ironwork for the substructure was on hand, and a temporary light had been established. Probable date of completion, spring of 1915. Amount expended to June 30, 1914, \$29,082.31.

Sabine Pass Jetty, Tex.—The act of May 27, 1908, appropriated \$40,000 for a light and fog signal at or near the end of Sabine Pass Jetty. Nothing has been done on the work, in view of the proposed project of the War Department to extend the jetties to the 25-foot contour, a distance of possibly 2 miles. At the close of the fiscal year 1914 no money had been expended or obligated.

NINTH DISTRICT.

Navassa Island Light Station, West Indies.—The act of October 22, 1913, appropriated \$125,000 for the erection of a light station on this island. On March 22-24, 1914, a survey of the island was made, and the plans and specifications are in progress.

It is expected that the light may be exhibited on or before January, 1916. Amount expended to June 30, 1914, none.

TENTH DISTRICT.

Ashtabula Harbor, Ohio.—The act of October 22, 1913, appropriated \$45,000 for rearranging, rebuilding, and improvement of the aids to navigation at Ashtabula Harbor, Ohio. The preliminary plans for this work have been approved and the work on the detailed plans is in progress. The establishment of acetylene flashing lights on the east and west pierheads will be completed during the season of 1914. It is expected to complete the work of building up the west pierhead during the present season and complete the project during the season of 1915. Amount expended to June 30, 1914, \$381.44.

Lorain Harbor, Ohio.—The act of October 22, 1913, appropriated \$35,000 for a light and fog-signal station and improvement of aids to navigation at Lorain Harbor, Ohio. The preliminary design for the structure has been approved. It is expected to complete the project during the season of 1915. Amount expended to June 30, 1914, \$994.43.

Cleveland Harbor, Ohio.—The act of October 22, 1913, appropriated \$17,600 for the removal, reconstruction, and improvement of the fog-signal station at Cleveland, Ohio. The detailed plans for the fog-signal house have been approved. It is planned to complete the structure during the present year. Amount expended to June 30, 1914, \$17.50.

ELEVENTH DISTRICT.

Ashland, Wis.—The act of October 22, 1913, appropriated \$25,000 for the construction of aids to navigation, Ashland, Wis. Plans were prepared and approved for a reinforced concrete tower on the pierhead of breakwater. The lighting and fog-signal system will be electrically operated from shore by means of a submarine cable. Keeper's quarters and boathouse will be provided in Ashland. It is expected that the work will be completed before December 1, 1914. Amount expended to June 30, 1914, \$1,486.91.

Detroit River, Mich.—The act of March 4, 1911, appropriated \$210,000 for establishing aids to navigation along the Livingstone Channel, Detroit River, Mich., including authority to locate and construct lights and to place buoys necessary to properly mark this channel. On June 30, 10 concrete pier structures were complete, the lights on 6 having been placed in commission. Sixteen gas buoys had been established and 20 spar buoys. Plans have been approved for two permanent structures at the sites of two of the gas buoys, and it is expected that these will be completed by December 1, 1914. The lighting of the other four permanent structures will be done as soon as the completion of dredging operations of the War Department make them necessary. Amount expended to June 30, 1914, \$124,264.40.

Superior Entry, Wis.—The act of June 30, 1906, appropriated \$20,000 for range lights at Superior Pierhead, Lake Superior, Wis. The act of March 4, 1911, appropriated \$25,000 for completing the lighting of breakwaters and piers at Superior Entry, Wis. Lights on the outer north breakwater and inner north pierhead were completed and established on October 10, 1912. The main light and fog-signal station was completed and went into commission on June 30, 1913. The inner south pierhead light was completed on October 10, 1912, and went into commission on June 12, 1914, when the remains of the old breakwater outside it had been dredged away. The need of an additional light under this project will be taken up when plans of the United States engineers for additional dredging at the inner end of piers have become definite. Amount expended to June 30, 1914, \$34,442.47.

TWELFTH DISTRICT.

White Shoal, Mich.—The act of March 4, 1907, appropriated \$250,000 for a light and fog-signal station at White Shoal, north end of Lake Michigan, to replace the White Shoal Light Vessel, which was then located over these dangerous shoals. The light was placed in commission on September 1, 1910, and the fog signal on September 15, 1910. A submarine bell was established September 20, 1911. A water-supply system was completed in October, 1911. The oil-storage system was installed during June, 1913. Drawings have been prepared for air-drive hoist for the three boat cranes and bids will shortly be asked for furnishing. A temporary acetylene winter light was authorized May 25, 1914. Amount expended to June 30, 1914, \$224,662.58.

Manistique, Mich.—The act of October 22, 1913, appropriated \$20,000 for aids to navigation at Manistique, Mich. A skeleton steel tower and lighting equipment has been ordered for the west breakwater, and plans for light and fog signal, also keeper's dwelling on the east breakwater have been prepared. Negotiations for purchase of

a site for dwelling have been completed. It is expected that the work will be completed by November, 1915. Amount expended to June 30, 1914, none.

Oconto, Wis.—The act of October 22, 1913, appropriated \$5,000 for a pierhead light and lighted buoy at Oconto, Wis. The War Department is now reconstructing the east end of south pier in concrete. Orders have been placed for skeleton steel tower and lighting equipment, and a buoy has been ordered, subject to results of tests to be made. It is expected that the work will be completed by June, 1915. Amount expended to June 30, 1914, \$167.10.

SIXTEENTH DISTRICT.

Cape St. Elias Light and Fog-Signal Station.—The act of October 22, 1913, appropriated \$115,000 for a light and fog signal to be established at or near Cape St. Elias, Alaska. The lens, pedestal, and clock for the station have been ordered. Selection of a site and the preparation of plans and specifications for the station have been deferred pending an examination and survey of the locality, which was in progress at the close of the fiscal year. An examination of the site could not be made at an earlier date on account of unfavorable weather conditions during the winter and the impracticability of obtaining transportation to the locality during the late spring. It is expected that the light and fog signal will be placed in operation in the fall of 1916. Amount expended to June 30, 1914, \$13.50.

Lincoln Rock Fog-Signal Station, Alaska.—The act of March 4, 1911, appropriated \$25,000 for rebuilding and improving the light and fog signal at Lincoln Rock, Alaska, on the present or an adjacent site. It is estimated that the work is now 99 per cent completed and the total cost to June 30, 1914, is \$24,758.90.

Aids to navigation, Alaska.—The act of March 4, 1911, appropriated \$60,000 for the purpose of establishing aids to navigation in Alaskan waters. There has been expended to June 30, 1914, a total of \$58,232.52, leaving a balance of \$1,767.48, of which about \$850 is obligated. During the year 10 lights were established.

SEVENTEENTH DISTRICT.

Aids to navigation, Puget Sound, Wash.—The act of October 22, 1913, appropriated \$30,000 for aids to navigation and improvement of existing aids in Puget Sound and adjacent waters, Washington. Under this appropriation the following work was performed: Remodeling of Slip Point Light Station, Clallam Bay; establishment of Point Partridge gas and bell buoy, Strait of Juan de Fuca; acetylene lights at Lime Kiln, Haro Strait; and Marrowstone Point, Admiralty Inlet. Additional aids will be established under this appropriation as rapidly as possible, and it is expected that all work will be completed in June, 1915. Amount expended to June 30, 1914, \$5,997.58.

Warrior Rock, Oreg.—The act of October 22, 1913, appropriated \$2,000 for improving Warrior Rock Light Station, Oreg., including the purchase of additional land. Steps were taken to obtain title to a small tract adjoining the reservation, in order that the keeper may be properly quartered. It is expected that the work will be completed about June, 1915. Amount expended to June 30, 1914, none.

EIGHTEENTH DISTRICT.

Point Arena Light Station, Cal.—The act of October 22, 1913, appropriated \$3,000 for the completion of the unfinished portion of the Government road from Rollerville to the Point Arena Lighthouse. Contract was entered into April 24, 1914, for the work, which was completed June 30, 1914. It is proposed to shape and roll the road again after rains have fallen. Amount expended to June 30, 1914, \$1,417.57.

NINETEENTH DISTRICT.

Kilauea Point, Kauai Island, Hawaii.—The act of May 27, 1908, appropriated \$75,000 for a light and fog-signal station at some point on the northerly or westerly coast of Kauai Island, Hawaii. On May 1, 1913, the light was put in operation, the station being 93 per cent completed. On June 30 the station was 98 per cent completed. The station comprises a reinforced concrete tower, with basement, supporting a first-order helical bar lantern and containing a second-order revolving lens and i. o. v. apparatus; reinforced concrete oil house; three dwellings, each containing six rooms and laundry; a power-operated steel boom derrick with landing platform; roadways; a 2-mile sanitary water supply pipe line with power operated pump and reinforced concrete tank for gravity distribution upon the reservation. The dwellings and minor improvements to the grounds remain to be completed, for which an additional appropriation of \$3,000 was made by the act of August 1, 1914, subsequent to the close of the fiscal year. It is expected that all work will be completed by January, 1915. Amount expended to June 30, 1914, \$74,629.41.

UNEXPENDED BALANCES ON JUNE 30, 1914, FROM APPROPRIATIONS FOR SPECIAL WORKS.

| District. | Title of appropriation. | Acts. | Balance. |
|-----------|---|--|--------------|
| General. | Tender for first lighthouse district. | May 27, 1908; Mar. 4, 1909. | \$194,062.45 |
| | Tender for fifteenth lighthouse district. | Mar. 4, 1907. | 31,631.91 |
| | Light vessels for general service. | Aug. 24, 1912. | 130,000.00 |
| | | Aug. 26, 1912. | 191,155.61 |
| | Oil houses for light stations. | Mar. 4, 1909; June 25, 1910. | 4,334.64 |
| | Lightkeepers' dwellings. | May 27, 1908. | 3,201.17 |
| | Storehouses for oil. | do. | 10.98 |
| 1st. | Monhegan Island Fog Signal, Me. | Mar. 4, 1911. | 1,822.43 |
| 3d. | Staten Island and West Bank Light Station, N. Y. | June 30, 1906; Mar. 4, 1909. | 26,348.32 |
| | Newark Bay Beacon Lights, N. J. | Mar. 4, 1907; Oct. 22, 1913. | 5,066.77 |
| | Tender for engineer, third lighthouse district. | do. | 272.15 |
| | Negro Point Light Station, N. Y. | May 27, 1908. | 2,971.96 |
| | Point Judith Lighted Buoy, R. I. | do. | 534.31 |
| | Point Judith Breakwater Lights, R. I. | Mar. 4, 1909. | 2,482.84 |
| | Repairs to lighthouse tender Pansy. | do. | 5,463.38 |
| | Staten Island lighthouse depot, N. Y. | Mar. 4, 1911. | 11,275.04 |
| | Stonington Light Station, Conn. | do. | 492.27 |
| | Rondout Creek Light Station, N. Y. | do. | 39,974.50 |
| | Hunts Point Light Station, N. Y. | do. | 5,000.00 |
| 4th. | Joe Flogger Shoal Light Station, Delaware River. | June 30, 1906. | 39,396.79 |
| | Miah Maul Shoal Light Station, Delaware River. | June 30, 1906; Mar. 4, 1907; Mar. 4, 1911. | 1,769.25 |
| | Brandywine Shoal Light Station, Del. | Mar. 4, 1911. | 20,853.30 |
| 5th. | Chesapeake Bay, lighted buoys. | May 27, 1908. | 3,759.17 |
| | Thimble Shoal Light Station, Va. | June 25, 1910; Aug. 26, 1912. | 54,724.53 |
| | Fort McHenry Channel Range Lights, Md. | Mar. 4, 1911. | 85,134.48 |
| | Lighting Norfolk Harbor, Va. | do. | 18,979.24 |
| 6th. | Tender for engineer, sixth lighthouse district. | May 27, 1908. | 27,514.27 |
| | Cape Fear River Lights, N. C. | Mar. 4, 1911; Aug. 26, 1912. | 1,189.05 |
| | Depot for sixth lighthouse district. | Oct. 22, 1913. | 125,000.00 |
| 8th. | Galveston Jetty Light Station, Tex. | June 11, 1896; May 27, 1908. | 15,917.69 |
| | Tender for inspector eighth lighthouse district. | Mar. 4, 1907. | 6,084.36 |
| | Sabine Pass Jetty Light Station, Tex. | May 27, 1908. | 40,000.00 |
| | Southwest Pass Light Vessel, Mississippi River. | Oct. 22, 1913. | 124,850.00 |
| | Aids to navigation, Atchafalaya Entrance Channel, La. | do. | 50,000.00 |
| 9th. | San Juan lighthouse depot, P. R. | May 27, 1908. | 1,999.97 |
| | Navassa Island Light Station, W. I. | Oct. 22, 1913. | 125,000.00 |
| 10th. | Buffalo Breakwater North End Light Station, N. Y. | Mar. 4, 1911. | 6,718.29 |
| | Point Abino Light Vessel, Lake Erie. | do. | 19,985.30 |
| | Cleveland Fog-Signal Station, Ohio. | Oct. 22, 1913. | 17,582.50 |
| | Aids to navigation, Ashtabula Harbor, Ohio. | do. | 44,618.56 |
| | Aids to navigation, Lorain Harbor, Ohio. | do. | 34,006.57 |
| 11th. | Superior Pierhead Range Lights, Wis. | June 30, 1906. | 10,557.53 |
| | Detroit River Lights, Mich. | Mar. 4, 1911. | 85,735.60 |
| | Aids to navigation, St. Marys River, Mich. | Aug. 26, 1912. | 3,720.32 |
| | Aids to navigation, Ashland, Wis. | Oct. 22, 1913. | 23,513.09 |
| 12th. | Milwaukee Light Vessel, Wis. | May 27, 1908. | 1,958.67 |
| | White Shoal Light Station, Lake Michigan. | Mar. 4, 1907. | 25,337.42 |
| | Oconto Harbor Lights, Wis. | Oct. 22, 1913. | 4,832.90 |
| | Aids to navigation, Manistique, Mich. | do. | 20,000.00 |
| 16th. | Lincoln Rock Light Station, Alaska. | Mar. 4, 1911. | 241.10 |
| | Aids to navigation, Alaska. | Mar. 4, 1909. | 1,767.48 |
| | Cape St. Elias Light Station, Alaska. | Oct. 22, 1913. | 114,986.50 |
| 17th. | Aids to navigation, Puget Sound, Wash. | do. | 24,002.42 |
| | Warrior Rock Light Station, Oreg. | do. | 2,000.00 |
| 18th. | Point Arena Light Station, Cal. | do. | 1,582.43 |
| 19th. | Kauai Island Light Station, Hawaii. | May 27, 1908. | 370.59 |

BALANCES OF SPECIAL APPROPRIATIONS CARRIED TO THE SURPLUS FUND ON JUNE 30, 1914.

The following-named balances of special appropriations under the Lighthouse Service remaining on the books of the Treasury Department, and relating to works which had been completed and against which no obligations were known to exist were carried to the surplus fund on June 30, 1914:

| | |
|---|-----------|
| Edgemoor Lighthouse Depot, Del. | \$31.57 |
| Bogue Sound Range Lights, N. C. | 234.31 |
| Frying Pan Shoal Light Vessel, N. C. | 10,860.38 |
| Sand Island Light Station, Ala. | 791.16 |
| Relief light vessel, ninth and eleventh lighthouse districts. | 194.40 |
| North Point Light Station, Wis. | 417.85 |
| Battery Point Fog Signal, Wash. | 363.52 |
| Point Loma Light Station, Cal. | 50.14 |
| San Pedro Breakwater Light Station, Cal. | 635.55 |

Total carried to surplus fund..... 13,578.88

SAVING OF LIFE AND PROPERTY BY VESSELS OR EMPLOYEES OF THE LIGHTHOUSE SERVICE DURING THE FISCAL YEAR 1914.

| District. | Vessel or employee rendering service. | Vessel, etc., aided. | Nature of assistance. |
|-----------|--|--|---|
| 1st.... | Tender Hibiscus..... | Schooner Alice..... | Pulled vessel off rocks at Allens Ledge, Me. |
| | Jerome H. Peasley, keeper, Crabtree Ledge Light Station, Me. | Schooner-yacht White Wings. | Rendered assistance in getting yacht off rocks near station. |
| | Tender Zizania..... | Schooner Carrie May.. | Towed schooner which in fog had anchored in dangerous position near rocks. |
| | James Burke, keeper, Cape Neddick Light Station, Me. | Launch..... | Towed to Cape Neddick Light Station launch that had become disabled; taking care of occupants overnight. |
| | Mitchell Blackwood, keeper, and Chas. A. Radley, second assistant keeper, Boon Island Light Station, Me. | Power boat..... | Rescued two men from being driven to sea in disabled power boat and brought them to light station. |
| | Heber G. Sawyer, keeper, Bear Island Light Station, Me. | Motor boat..... | With personal power launch picked up and towed 1 mile disabled launch with man aboard. |
| | James Burke, keeper, Cape Neddick Light Station, Me. | Samuel L. Lewis..... | Burke went to rescue of Mr. Lewis, taking him from water, furnishing him with dry clothes, and caring for him. Mr. Lewis states owes life to Burke. |
| | Tender Hibiscus..... | Schooner Harriet C. Whitehead. | Assisted tug Betsey Ross in pulling schooner off rocks. |
| | Charles H. Jennings, keeper, Monomoy Light Station, Mass. | Power boat; owner, Theodore Drew. | Assisted in getting disabled boat to safe anchorage. |
| | Joseph B. McCabe, keeper, and C. B. Bassett, assistant keeper, Deer Island Light Station, Mass. | Steam launch from U. S. S. North Carolina. | Carried towline from tug to disabled launch. Party of men and women on board besides crew of 5 enlisted men. |
| 2d.... | Shovelful Shoal Light Vessel No. 3, Mass. | Motor boat Chappaquiddick. | Four men taken off disabled boat and cared for on board light vessel overnight. |
| | John W. Davis, keeper, Annisquam Light Station, Mass. | Yacht Jack Tarr..... | Brought to shore 2 men from stranded vessel and furnished them dry clothing. |
| | Pollock Rip Shoals Light Vessel No. 73, Mass. | Power launch; owner, Leo H. Leary. | Picked up adrift. |
| | George E. Kezer, keeper, Lovells Island Lighthouse Depot. | Five fishing dories from schooner Olive F. Hutchins. | Schooner wrecked. Recovered 5 boats adrift. |
| | Charles A. Baker, keeper, Butler Flats Light Station, Mass. | Motor boat; owner, Chas. E. Jones. | Saved boat from going to pieces on rocks. Towed boat with 3 men aboard to wharf. |
| | Tender Mayflower..... | Tug Mary Arnold (owners, Ross Towboat Co.) and lighter R. G. No. 1 (owners, Rockport Granite Co.). | Vessels stranded. Tender's launch towed lighter to anchorage and stood by tug until daylight. Tender towed vessels to safe anchorage. |
| | Tender Anemone..... | Steamer Xiphias..... | Steamer grounded on Great Ledge, Woods Hole, Mass., lost her rudder, and was drifting with tide. Towed to wharf by tender's launch. |
| | Chester E. Morris, second officer, tender Anemone. | ..... | Went overboard to cut line that had become fouled in propeller. Accidentally injured while 10 feet under water. |
| | Winfield L. Creed, keeper, Broad Sound Channel Light Station, Mass. | ..... | Rescued man who was clinging to rigging of overturned boat; also brought to shore body of man drowned by the accident. |
| | Tender Anemone..... | Schooner Grace Darling. | Towed to harbor disabled schooner, anchored in dangerous and exposed position and flying signals of distress. |
| | Tender Mayflower..... | ..... | Picked up disabled fishing boat adrift with 2 men on board and towed it to harbor. |
| | Tender Anemone..... | Schooner G. M. Porter. | Schooner wrecked on Kill Pond Bar, Nantucket Sound, Mass. Crew of 5 men taken off and cared for on board tender overnight. |
| | Cross Rip Relief Light Vessel No. 9. | Schooner John Paul... | Crew of wreck picked up by light vessel, badly frozen, and cared for overnight. One man frozen to death. |

SAVING OF LIFE AND PROPERTY BY VESSELS OR EMPLOYEES OF THE LIGHTHOUSE SERVICE DURING THE FISCAL YEAR 1914—Continued.

| District. | Vessel or employee rendering service. | Vessel, etc., aided. | Nature of assistance. |
|-----------|--|--|--|
| 3d.... | Charles S. Curtis, keeper of Rose Island Light Station, R. I. | Power boat..... | Rescued men in disabled power boat fast going out to sea, and towed boat to Newport. |
| | William L. Tutty, keeper, New Haven Light Station, Conn. | Power boat containing George Blumley and Arthur Sacht, New York Motor Boat Club. | Boat helpless from breakdown; towed to safety. |
| | William Tangren, keeper, Mussel Bed Light Station, R. I., assisted by his son. | Power boat..... | Rescued 2 women and 1 man from overturned boat. |
| | Edward M. Grant, keeper, Old Orchard Shoal Light Station, N. Y. |do..... | Went to assistance of disabled power boat at great risk. Repaired its engine so party could proceed. |
| | George L. Costello, keeper, and Frederick C. Lovatt, second assistant keeper, Execution Rocks Light Station, N. Y. | Sailboat, R. Vogel, owner, New York. | Boat, containing 6 persons, on the rocks; women of party taken to lighthouse and made comfortable; boat towed to safety. |
| | Charles Redfern, keeper, Point Comfort Light Station, N. J. |do..... | Rescued Katherine Downey, 5 years of age, from danger of drowning. |
| | Edward M. Grant, keeper, Old Orchard Shoal Light Station, N. Y. | Power boat containing Messrs. Ulger, Opricola, Bernus, Chaphrewitz, and Kivol, all of Brooklyn, N. Y. | Boat containing men disabled $\frac{1}{2}$ mile off station; towed boat to station and gave men breakfast and dinner. |
| | Emil Usinger, assistant keeper, Great Captain Island Light Station, N. Y. | Sailboat, Walter J. Lyon, owner. | Ran upon rocks on northeast side of island; assistant keeper went to assistance of owner and 3 others, and provided party with dry clothing. |
| | Willis A. Green, keeper, Bridgeport Harbor Light Station, Conn. | Motor boat of torpedo destroyer McCall. | Cared for man, a survivor of crew of 4, who swam to station from a motor boat belonging to the McCall, which was run down by steamer Seaboard. |
| | Charles Schoeneman, keeper, Newport Harbor Light Station, R. I. | Power boat belonging to contractor building a wharf at Rose Island. | Boat drifted on rocks on west side of torpedo station; one man rescued and boat secured to prevent breaking up. |
| | Hans C. Anderson, keeper, Barber Point Light Station, N. Y. | Steamer Pearl, 20 tons, freight boat, with 2 men, Geo. La Valentine and Chas. Leplant, from Champlain, N. Y. | Ashore on a reef; assisted in getting boat off without apparent damages. |
| | Charles Redfern, keeper, Point Comfort Light Station, N. J. | Motor boat belonging to H. C. Smith, Murboro, N. J. | Owner not able to navigate boat and lost his direction; brought ashore and boat secured. |
| | Wilbur M. Plumley, quartermaster, tender Mistletoe. |do..... | Rescued Robert Lund, steward, who fell overboard. |
| | Tender Gardenia..... | U. S. A. mine planter Gen. John M. Schofield. | Assisted vessel when aground off Ellis Island, New York Bay. |
| | Charles W. Oliver, keeper, and Alfred Nelson, assistant keeper, Great Captain Island Light Station, N. Y. | Power boat Rex..... | 2 men taken off power boat powerless in gale; taken to station and fed. |
| 4th... | Cornfield Point Light Vessel No. 48. | Power boat..... | Sent boat to assistance of disabled power boat and towed it into Saybrook Point. |
| | C. W. Atkins, master, lighthouse tender Iris. | Schooner Grace Seymour. | Pulled vessel off Brown Shoal, Delaware Bay, into deep water. |
| | Edw. W. Long, keeper, Old Reedy Island Light Station, Del. |do..... | Rescued 3 young ladies adrift in rowboat about 3 miles from station and towed them to Augustine Pier. |
| | William Spear, keeper, Deep Water Point Range Front Light Station, N. J. | Motor boat Monacy, of Chester, Pa. | Towed boat to port; 5 men aboard; repaired engine for them. |
| 5th... |do..... | Motor boat Jennie, of Bristol, Pa. | Towed disabled boat to port; 2 men and 2 women aboard; examined engine and located trouble for them. |
| | C. W. Atkins, master, lighthouse tender Iris. | Four-masted schooner Margaret Thomas, of Boston, Mass. | Ashore on shoal above Fourteen Foot Bank; pulled her off into deep water. |
| | Thomas Jacobson, keeper, Point Lookout Light Station, Md. | U. S. N. flying boat C-1. | Rendered assistance to occupants when motor had become disabled. |
| | Tender Maple, Capt. Thomas J. Miles, commanding. | Gasoline launch Seaman's Friend, owned by Seaman's Friend Society, of Norfolk, Va. | Towed disabled launch with 10 people on board to safety. |

SAVING OF LIFE AND PROPERTY BY VESSELS OR EMPLOYEES OF THE LIGHTHOUSE SERVICE DURING THE FISCAL YEAR 1914—Continued.

| Dist- trict. | Vessel or employee rendering service. | Vessel, etc., aided. | Nature of assistance. |
|-----------------|--|---|--|
| 5th... | Loch W. Humphreys, keeper, Cedar Point Light Station, Md. Charles A. Sterling, keeper, Craney Island Light Station, Va. Tillman F. Smith, keeper, Washington, N. C., Lighthouse Depot. Daniel T. Paul, laborer in charge, Rumley Marsh Light, N. C. Robert H. Bertram, master, light vessel No. 80. Alonzo J. English, keeper, and John M. Stowe, assistant keeper, Harbor Island Bar Light Station, N. C. Mumford Guynn, keeper, and James O. Casey, assistant keeper, Pamlico Point Light Station, N. C. Wesley Austin, keeper, Ocracoke Light Station, N. C. John T. Shipp, keeper, and Thomas Quidley, assistant keeper, Neuse River Light Station, N. C. Alexander T. Loss, mate, light vessel No. 71 and crew of light vessel No. 71. Herbert R. Brownley, first officer, tender Juniper. E. L. Thomas, keeper, Tangier Sound Light Station, Va. Tender Maple, Thomas J. Miles, commanding. Mumford Guynn, keeper, and James O. Casey, assistant keeper, Pamlico Point Light Station, N. C. E. L. Thomas, keeper, Tangier Sound Light Station, Va. Randolph Scarborough, master, light vessel No. 80 and crew. William G. Rollinson, keeper, and Barney F. Peel, assistant keeper, Hatteras Inlet Light Station, N. C. Charles C. Tyler, keeper, and Gary E. Powell, assistant keeper, Great Shoals Light Station, Md. Tender Jessamine, master, Rufus A. Brooks, commanding. John B. Quidley, laborer in charge, Bogue Sound and Core Creek Lights, N. C. Ole O. Johnson, keeper, and Robert Kuhn, assistant keeper, Cobb Point Bar Light Station, Md. W. B. Clifton, keeper, and J. W. Cooper, assistant keeper, Roanoke River Light Station, N. C. Harry H. Wills, keeper, and Robert Williams, assistant keeper, Craighill Channel Range Rear Light Station, Md. | Launch; name and owner unknown. Mrs. A. J. Smith, of Portsmouth, Va. Lighthouse Depot, Washington, N. C. Lighthouse property.. Light vessel No. 80.... Harbor Island Bar Light Station, N. C. Pamlico Point Light Station, N. C. Ocracoke Light Station and Ocracoke Island, N. C. Neuse River Light Station, N. C. Light vessel No. 71.... Power boat A. T. Pinner, owner unknown. Gasoline launch; owner unknown. Schooner Carrie and Belle; owners unknown. Small gas boat; owner unknown. William A. Crockett, assistant keeper, Tangier Sound Light Station, Va. Light vessel No. 80.... Schooner Stow of Hatteras, N. C. Gasoline launch, owned and operated by Horace Messick, Nanticoke Point, Md. Motor boat and schooner, owners unknown. Freight boat George T. Capt. T. E. Gillikin. Lumber-laden power boat, owners, Olli Bailey and M. T. Wise, St. Marys County, Md. Launch Laura with a party of 4 persons aboard; owner unknown. Disabled gasoline launch; name and owner unknown. | Assisted launch with 4 men aboard while in distress. Recovered lady's watch accidentally dropped overboard. Saved buoys from going adrift from lighthouse depot in storm. Recovered lighthouse property after storm. Kept light displayed on light vessel with proper characteristics during storm. Saved Government property in their charge during storm. Do. Saved the Government property in his charge and gave shelter to the residents of Ocracoke Island during storm. Saved the Government property in their charge during storm. Kept light vessel near her station during storm. Rendered assistance to 3 men on board the power boat which had become disabled near Beaufort Inlet, N. C. Rendered assistance to disabled launch. Took wrecked schooner in tow and beached her on Cedar Point, Md. Rendered assistance to man in small gas boat which had broken down. Made brave but futile attempt to save the life of assistant keeper. Efficient service in handling light vessel and quickly returning her to station after she had parted moorings in hurricane. Rendered assistance to grounded schooner with crew of 3 men. Rendered assistance to party of 4 persons in disabled gasoline launch. Towed disabled motor boat to safety and floated beached lumber-laden schooner. Rendered assistance to disabled freight boat. Rendered assistance to disabled power boat. Rendered assistance to disabled launch. Rendered assistance to 2 men in the disabled launch. |

SAVING OF LIFE AND PROPERTY BY VESSELS OR EMPLOYEES OF THE LIGHTHOUSE SERVICE DURING THE FISCAL YEAR 1914—Continued.

| District. | Vessel or employee rendering service. | Vessel, etc., aided. | Nature of assistance. |
|--------------|---|---|---|
| 5th... | W. H. Davis, jr., keeper, and J. M. Ellis, assistant keeper, Lazaretto Point Depot and Light Station, respectively, Md. C. A. Sterling, keeper, Craney Island Light Station, Va. | Steamship Charles H. Warner; man overboard from. | Rendered assistance to man, name unknown, helping in his rescue from drowning. |
|do..... |do..... | Gasoline boat laden with potatoes; owner unknown. | Rendered assistance to disabled boat, saving her and cargo. |
|do..... |do..... | Gasoline boat Daisy. Gasoline and sailing vessel Mary San; owners unknown. | Rendered assistance to both boats and prevented them from running down station. |
| 6th... | Robert Cromley, assistant keeper, Sapelo Light Station, Ga. |do..... | Picked up at sea a motor boat belonging to private individuals which had been stolen. |
|do..... | Kristofer Mathisen, first officer, and Gabriel Baeza, seaman, tender, Mangrove. |do..... | Saved seaman on tender from drowning while relieving buoys St. Catherine Sound, Ga. |
|do..... | Iver Larsen, keeper, and Joel E. Hammett, assistant depot keeper, Castle Pinckney Depot, S. C. | Dory No. 10, Carolina Yacht Club; owner, I. Ancrum Finley. | Rescued crew from overturned boat; righted boat, and towed same to yacht club; also landed crew. |
| 7th... | Robert S. Meyer, keeper, and Clifton Lopez, assistant keeper, of Anclote Keys Light Station, Fla. | Power boats..... | Rendered assistance to one party aground in launch and to 2 men in disabled power boat. |
|do..... | Tender Magnolia..... | Steamer J. L. Luckenbach. | Assisted steamer, which was aground, into deep water. |
|do..... |do..... | Schooner Celia F..... | Towed schooner from dangerous position to deep water, saving schooner and cargo valued at \$100,000. |
|do..... | Edgar J. Russell, keeper, Holton M. Roberts, first assistant keeper, and Theophilus Sawyer, second assistant keeper, of Dry Tortugas Light Station, Fla. | Steamer Venus..... | Brought crew of disabled ship to light station, and next day Assistant Keeper Roberts conveyed engineer of steamer to Key West, consuming 15 hours in the round trip. |
|do..... | John Peterson, foreman, and H. P. Weatherford, keeper of Fowey Rocks Light Station, Fla., with members of working party. | Schooner Alice B. Phillips. | Rendered assistance to disabled schooner. |
|do..... | William Lester, keeper, and Jas. T. Williams, assistant keeper, of Gasparilla Island Range Light Station, Fla. | Power boats..... | Rendered assistance in saving two power boats which had gone ashore, and furnished shelter to men aboard. |
|do..... | Tender Arbutus..... | Steamer Veenbergen.. | Hauled steamer off Rebecca Shoal into deep water. |
| 8th... | John Asplund, keeper; J. D. Balsille, first assistant keeper; Engvald T. Eriksen, second assistant keeper; Galveston Harbor Light Station, Tex. |do..... | Rescued 2 men in Galveston Bay, Tex., whose skiff had become filled with water and were in danger of being drowned. |
|do..... | Charles W. Hearrt, keeper, Halfmoon Reef Light Station, Tex. | Launch Nettle; owner unknown. | Towed disabled launch to port and furnished master and crew with food. |
|do..... | Tender Sunflower..... | Steamer Appelschee; owner unknown. | Steamer had gone aground and tender floated her. |
|do..... | George R. Smith, keeper, and Leon R. Smith, assistant keeper, of Red Fish Bar Cut Light Station, and Galveston Bay Light No. 2, Tex. |do..... | Rescued and cared for man from stranded sloop; also saved a large portion of cargo, and when weather moderated got sloop off reef into deep water. |
|do..... |do..... | Power boat Florence; owner unknown. | Brought to the light station 7 men, passengers and crew of power boat, which had blown ashore on a reef. |
|do..... | Tender Sunflower and Henry Rhein, laborer, Mobile Depot, Ala. |do..... | Extinguished fire on floating pile driver. |
| 9th... | Domingo Suarez Rosa, keeper, Guanica Light Station, P. R. | Pilot boat..... | Assisted pilot whose boat had capsized near light station. |
|do..... | Jose P. Castillo, first assistant keeper, Mona Island Light Station, P. R. | Motor boat..... | Assisted party of 7 persons in a disabled gasoline launch and cared for them until the arrival of a vessel to carry them to Mayaguez. |
|do..... | Teofilo Ruiz, keeper, Cabras Island Light Station, P. R. | Schooner Maria Dolores. | Rendered assistance with the station boat to the vessel, which had grounded near the light station. |
|do..... | Manuel del Olmo, keeper, and Agustin S. Cruz, assistant keeper, of Cape San Juan Light Station, P. R. | Fishing boat Primavera. | Rescued from drowning a man from an overturned fishing boat. |

SAVING OF LIFE AND PROPERTY BY VESSELS OR EMPLOYEES OF THE LIGHTHOUSE SERVICE DURING THE FISCAL YEAR 1914—Continued.

| District. | Vessel or employee rendering service. | Vessel, etc., aided. | Nature of assistance. |
|-----------|---|--|---|
| 9th... | Tender Ivy..... | Sloop Horizonte..... | Assistance rendered to sloop which, with 6 men on board, was dismantled and in distress. |
| 10th.. | Daniel D. Hill, keeper, Cross Over Island Light Station, N. Y. | Steamer John Lambert; owner, Great Lakes & St. Lawrence Navigation Co. | Brought master to shore in lighthouse launch when steamer ran on shoal about 1 mile from light station. |
| | Horace E. Walts, keeper, Sunken Rock Light Station, N. Y. | Launch Erin, owners, Messrs. Poole. | Furnished shelter for night and breakfast to 2 men and took them to Alexandria Bay, N. Y. |
| 11th.. | George W. Smith, keeper, Samuel Masticotte, assistant keeper, Round Island (Straits) Light Station, Mich. | Motor boat; owner not known. | Motor boat disabled in gale; one man taken ashore by keepers in row boat. |
| | William L. Campbell, keeper, Lewis B. Curtis, second assistant keeper, tender Aspen. | Point Iroquois Light Station. | Saved station from destruction by forest fire. |
| 12th.. | Ross F. Wright, first assistant keeper, Manitowoo Light Station, Wis. | Tug Duncan City..... | Saving property. |
| | William Gordon, first assistant keeper, North Manitou Light Station, Wis. | Power boat..... | Towed boat to safety; repaired machinery and supplied crew of 6 men with food. |
| | George J. Cornell, keeper, St. Joseph Pierhead Light Station, Mich. | Launch Wolverine.... | Prevented stranding by getting a line to boat and assisted in getting boat into harbor. |
| | William H. Nash, second assistant keeper, Wind Point Light Station, Wis. | Hydroplane Firefly... | Rendered assistance to disabled machine and helped tow it to shore. |
| | Edward W. Knudsen, keeper, Racine Reef Light Station, Wis. | Motor boat..... | Towed into safety disabled boat with 4 people on board. |
| | Thomas Robinson, keeper, and Joseph Edlund, second assistant keeper, Muskegon Light Station, Mich. | Motor boat Ida L..... | Towed disabled motor boat to port. |
| | Emil C. Tews, first assistant keeper, Waukegan Harbor Light Station, Ill. | Small boat..... | Rescued from probable drowning a duck hunter in a disabled boat in heavy sea. |
| | Tender Hyacinth, master, John K. Olsen. | Steamer Cepheus..... | Pulled into deep water; steamer was ashore. |
| | Reynold W. Johnson, keeper, Nels Nelson, first assistant keeper, and Martin Larsen, second assistant keeper, North Manitou Light Station, Mich. | U. S. mail service..... | Rendered assistance to 2 men carrying the mail who had been caught in the ice and furnished them food. |
| |do..... | Gasoline launch..... | Rendered assistance in saving launch which had been driven ashore, and furnished clothing, board, and lodging for 4 days to the 2 men on board. During storm 9 men were rescued from sinking dredge and water-logged tug was towed into port. |
| | Tender Sumac, master, Charles H. Hubbard, first officer, Harry W. Maynard, second officer, George K. Brown, and crew. | Dredge Marion and tug Erie. | Went to assistance of drowning man. |
| 13th.. | Leslie T. Hill, mate-carpenter, and William V. Bailey, quartermaster, tender Goldenrod. | ..... | Subsisted detained man at station for 3 months. |
| 16th.. | W. J. Pearson, assistant keeper, Scotch Cap Light Station, Alaska. | Henry Taiplus, prospector. | Picked up disabled launch in Stephens Passage and towed 6 miles to safe harbor. |
| | Gas boat Monaghan chartered by Lighthouse Service. | Launch had no name; G. J. Dela on board. | Stopped at the station seeking food, which was furnished. |
| | N. S. Douglas, keeper Lincoln Rock Fog Signal Station, Alaska. | Small boat; Nick Olsen, owner. | Picked up in Dixon Entrance and brought to Ketchikan. |
| | Columbine, First Officer J. W. Leadbetter in command. | Small skiff; W. Wells on board. | Mr. Gardner, superintendent of Chilcat Cannery Co., taken off wrecked vessel and carried to Haines. |
| | Columbine, Wm. E. Gregory, master. | Cannery tender Chilcoat, owned by Chilcat Cannery Co. | Rendered assistance to party of 3 men in launch which had sunk about 5 miles from station. |
| 17th.. | Hans P. Score, keeper of Slip Point Light Station, Wash. | Gasoline launch Spirit. | Rescued a party of 6 persons from a disabled launch and brought them to port. |
| | Officers and crew of tender Manzanita. | Launch Elsie; name of owner unknown. | Rendered assistance to disabled launch. |
| | Officers and crew of Columbia River Light Vessel No. 88, Oreg. (David Ingram, mate in charge.) | Launch Jack Burnham | |

SAVING OF LIFE AND PROPERTY BY VESSELS OR EMPLOYEES OF THE LIGHTHOUSE SERVICE DURING THE FISCAL YEAR 1914—Continued.

| District. | Vessel or employee rendering service. | Vessel, etc., aided. | Nature of assistance. |
|-----------|--|--|--|
| 17th.. | Clifford B. Hermann, keeper; Carl Lien, first assistant keeper; Anders G. Berner, second assistant keeper, Destruction Island Light Station, Wash. Officers and crew of Columbia River Light Vessel No. 88, Oreg. | Schooner Aloha, R. Petterson, master; name of owner unknown. Unnamed launch; E. Berg and Chas. Lindstrom owners. Launch Albatross; Ernest Fletcher, owner. | Rendered assistance to officers and crew of the schooner Aloha anchored in distress near station. Sheltered on board light vessel during stormy weather. Rendered assistance in floating and beaching a launch which had run on rocks and sunk near station. |
| | Clifford B. Hermann, keeper; Carl Lien, first assistant keeper; Anders G. Berner, second assistant keeper; Ralph J. Nead, third assistant keeper, Destruction Island Light Station, Wash. Officers and crew of Relief Light Vessel No. 92, on Columbia River Light Vessel No. 88 Station, Oreg. | Fishing boat O. 01394; name of owner unknown. | Picked up boat, gave men food, and turned them with their boat over to tug. |
| | Michael Ludescher, assistant keeper Burrows Island Light Station, Wash. | Gasoline launch; name and owner unknown. | Assistance rendered to party of 7 persons in launch disabled near the station. |
| 19th.. | Tender Kukui..... | Dredge Governor, Hawaiian Dredging Co., Honolulu, Hawaii. | Helped to extinguish fire when dredge was burning. |
| |do..... | S. C. Allen, Allen & Robinson (Ltd.), Honolulu, Hawaii. | Assisted in an effort to pull the Allen off the reef at Diamond Head, Oahu. Vessel lost. |

DAMAGE BY COLLISIONS.

The following is a list of the more important collisions affecting the property of the Lighthouse Service which occurred during the fiscal year 1914:

On July 21, 1913, Stone Horse Shoal North End Gas Buoy, 5A, was run over by an unknown vessel. Repairs were made at a cost of \$256.

On September 27, 1913, Cross Rip Light Vessel No. 5 was fouled by two coal barges in tow of the tug *Honeybrook*. Repairs, costing \$224.55, were paid for by the owners of the tug.

On January 21, 1914, Shovelful Shoal Light Vessel No. 3 was collided with by the schooner *General Adelbert Ames*. Efforts were made to recover the cost of repairs, \$325, from the owners, but the bill was finally paid by the Lighthouse Service. The schooner was wrecked and became a total loss.

On March 15, 1914, Hedge Fence Light Vessel No. 41 was collided with by the schooner *Harwood Palmer*. Repairs, amounting to \$628, have not yet been made. Owners of schooner have agreed to pay bill when rendered.

On January 14, 1913, Scotland Light Vessel No. 11 was run into by scow No. 8X in tow of tug *Henry S. Bund*. Repairs, costing \$100, were made by owners of the tug.

On January 3, 1914, Great Beds Light Station, N. J., was struck by the schooner *Nettie Shipman*, dragging her anchors, during a gale. The station rowboat was crushed, davits carried away, and other damage done to station, amounting in all to about \$260. The accident being unavoidable, no action was taken to collect the cost of repairs.

On March 23, 1914, Main Channel Buoy No. 2, New York Bay, was found dragged from station in a damaged condition, and evidence found indicated that buoy had been run into by a dump scow. The damage amounted to about \$225. All efforts to ascertain the name of vessel doing the damage were unavailing.

On March 7, 1914, Ambrose Channel Buoy No. 13, New York Lower Bay, was run over and badly damaged, presumably by a dump scow. The total damage amounted to about \$1,000. All efforts to obtain the name of the vessel doing the damage have been unavailing.

On March 31, 1914, Ambrose Channel Buoy No. 17, New York Lower Bay, was found in a badly damaged condition, due to its having been run over by some unknown vessel. The damage amounted to about \$358. All efforts to obtain the name of vessel doing the damage have been unavailing.

On April 11, 1914, Ambrose Channel Buoy No. 17, New York Lower Bay, was dragged out of position and damaged to the extent of about \$300, by the tugboat *Gerry*. The matter of compelling the owners of the tug *Gerry* to pay for the cost of repairs to the buoy is now in the hands of the Department of Justice.

On November 8, 1913, the tender *Maple* was run into by the steamer *Piantatant*. Repairs costing \$1,774.50 were made by the Government. The collision occurred in heavy fog, and both masters were exonerated.

On March 27, 1914, Thirty-five-Foot Channel Light Vessel No. 45 was run into by the tug *Columbia*. Repairs costing about \$1,400 were made at the expense of the owners of the tug.

On April 30, 1914, the tender *Maple* struck some unknown submerged object, breaking one blade off port propeller. Repairs, installing new propeller, etc., costing about \$425, were made by the Government.

On February 20, 1914, steamship *Persian*, in avoiding collision with U. S. dredge *Morgan*, backed into Upper Flats Range Front Light, Savannah River, Ga., knocking structure down. The structure was rebuilt by the owners of the offending vessel by private contract at a cost of \$475.

On May 22, 1914, the tug *Philadelphia* collided with and knocked down Arlington Creek Light No. 21A, St. Johns River, Fla. Efforts are being made to recover the amount of damage, \$120.08.

On June 16, 1914, the tug *Philadelphia* collided with and knocked down Murphy Island Light No. 57, St. Johns River, Fla. Efforts are being made to recover the amount of damage, \$140.

On June 23, 1914, the towboat *William Pitt* drifted against and knocked down Cedar Creek Light No. 17, St. Johns River, Fla. Efforts are being made to recover the cost of rebuilding structure and replacing lantern in the sum of \$137.13.

On April 12, 1914, Southwest Channel Light, Fla., was collided with by the schooner *City of Baltimore*. Repairs, costing \$223.41, were made by the owners of the schooner.

On February 16, 1914, Cutoff Channel Range Front Light, Ala., was run into and destroyed by a barge. Repairs, amounting to \$729.29, have been assumed by the owner.

On May 30, 1914, South Pass East Jetty, La., boathouse was run into by steamship *Ponce*. Repairs, amounting to approximately \$903.65, will be assumed by the owners.

On November 10, 1913, Light Vessel No. 82, on Buffalo Light Vessel Station, was wrecked in storm and sunk in Lake Erie near her station, with her entire crew of six men. The vessel was valued at \$50,000.

On May 26, 1914, the steamer *Thomas Barlum* collided with fog-signal building, Calumet Pierhead Light Station, Ill., tearing off rail and stanchions, damage approximately \$125. The owners have agreed to pay for the damage.

On July 18, 1913, the schooner *Wonder* struck and destroyed the Petaluma Creek Light No. 6. The owners of the schooner refused to replace the structure. Libel suit was entered, and the schooner was sold, with net proceeds of \$91.33. The light and structure were replaced by the Government at a total cost of \$544.17.

On August 15, 1913, Alviso Channel Beacon No. 11 was either blown down or destroyed by some unidentified vessel. The cost of replacing the beacon was \$132.10.

On August 30, 1913, the steamer *Petaluma* landed without permission at the East Brother Island Light Station, damaging three piles. The piles were replaced by the owners of the vessel.

On December 10, 1913, the steamer *Onisbo* collided with and destroyed the New York Slough East End Light and Echo Board. The structure was replaced by the owners of the vessel.

On January 16, 1914, a tug towing a barge owned by the Crowley Launch & Tugboat Co., collided with and severely damaged the wharf at East Brother Island Light Station. Repairs were made by the owners of the tug.

On January 17, 1914, the ferry steamer *Encinal* struck and destroyed the Oakland Harbor South Jetty Light. The owners of the vessel replaced the light structure.

The following damage was caused by vessels doing work of the Lighthouse Service during the year:

On September 1, 1913, the lighthouse tender *Juniper*, while passing the barge *Thomas O. Stran*, in the Chesapeake and Albemarle Canal, N. C., struck and damaged the barge to the extent of \$65.38.

On January 19, 1914, light vessel No. 29, while in tow of the lighthouse tender *Woodbine*, was blown against the dock of Smith & McCoy, at Norfolk, Va., and damaged it to the extent of \$10.

The Lighthouse Service was responsible for these two collisions, and in accordance with section 4 of the act approved June 17, 1910 (36 Stat., 537), appropriations were recommended to Congress in the above amounts, ascertained to be due the claimants, which appropriations were made by the act of April 6, 1914.

On April 2, 1914, the lighthouse tender *Larkspur*, while landing material at a dock in Jersey City, N. J., struck and damaged the dump scow *J. J. Fleming No. 2* to the extent of \$124.50.

On April 23, 1914, the lighthouse tender *Tulip*, while working into railroad pier on East River, N. Y., struck and damaged the lighter *Eugene Grasselli* to the extent of \$30.97.

On June 3, 1914, the lighthouse tender *Iris*, while replacing a buoy at Schooner Ledge, Delaware River, N. J., fouled a mooring of the dredge *Columbia*, damaging it to the extent of \$176.75.

On June 29, 1914, light vessel No. 79, while entering coal dock at Jersey City, N. J., struck the coal barge *Bituminous* and caused damage to the extent of \$467.92.

The Lighthouse Service was also responsible for these four collisions and steps will be taken to recommend appropriations in the sums ascertained to be due the claimants, in accordance with the act of Congress above mentioned.

PUBLICATIONS OF THE LIGHTHOUSE SERVICE.

[All publications are at present distributed free.]

| Publication. | Date of last edition. | Cost of last edition. | Number distributed. |
|---|-----------------------|-----------------------|---------------------|
| Light lists: | | | |
| Atlantic and Gulf coasts of United States..... | Jan. 1, 1914 | \$4,550 | 11,436 |
| Pacific coast of United States, etc..... | do..... | 1,389 | 3,071 |
| Great Lakes of United States and Canada..... | Oct. 1, 1912 | 2,579 | 662 |
| Upper Mississippi River and tributaries..... | July 15, 1913 | 829 | 1,065 |
| Ohio River and tributaries..... | Sept. 15, 1913 | 578 | 816 |
| Lower Mississippi River and tributaries..... | Nov. 15, 1913 | 345 | 840 |
| Buoy lists: | | | |
| First district..... | Jan. 1, 1914 | 1,157 | 4,883 |
| Second district..... | do..... | 949 | 4,847 |
| Third district..... | Aug. 1, 1913 | 1,856 | 6,080 |
| Fourth district..... | Sept. 1, 1913 | 408 | 4,419 |
| Fifth district..... | Apr. 15, 1913 | 1,682 | 4,594 |
| Sixth district..... | Jan. 1, 1914 | 954 | 3,044 |
| Seventh district..... | do..... | 536 | 2,384 |
| Eighth district..... | Dec. 15, 1912 | 635 | 539 |
| Ninth district..... | Dec. 15, 1913 | 162 | 861 |
| Tenth district..... | July 1, 1912 | 539 | 89 |
| Eleventh district..... | Oct. 1, 1912 | 752 | 653 |
| Twelfth district..... | July 1, 1912 | 636 | 412 |
| Sixteenth district..... | June 1, 1913 | 305 | 983 |
| Seventeenth district..... | Jan. 1, 1914 | 649 | 1,260 |
| Eighteenth district..... | do..... | 399 | 1,116 |
| Nineteenth district..... | June 30, 1913 | 179 | 916 |
| Miscellaneous publications: | | | |
| Weekly Notice to Mariners..... | 1914 | \$ 7,749 | 188,509 |
| Annual Report, Lighthouse Board..... | 1907 | 2,369 | 183 |
| Do..... | 1908 | 1,818 | 51 |
| Do..... | 1909 | 1,897 | 60 |
| Do..... | 1910 | 361 | 4 |
| Annual Report, Commissioner of Lighthouses: | | | |
| Part I..... | 1911 | 468 | 10 |
| Part II..... | 1911 | 680 | ..... |
| Part I..... | 1912 | 572 | 68 |
| Part II..... | 1912 | 322 | ..... |
| Part I..... | 1913 | 659 | 1,336 |
| Part II..... | 1913 | 228 | ..... |
| Regulations for the United States Lighthouse Service..... | 1911 | 745 | 32 |
| Instructions to light keepers..... | 1911 | 49 | 46 |
| Instructions to officers of vessels..... | 1911 | 32 | 5 |
| Medical handbook..... | 1912 | 440 | 57 |
| Lighthouse Service bulletins..... | 1914 | \$ 217 | 15,900 |
| Regulations for lighting bridges..... | 1912 | 122 | 474 |
| Regulations for uniforms..... | 1912 | 70 | 12 |
| Civil-service regulations..... | 1913 | 73 | 100 |
| Instructions for cost keeping..... | 1912 | 99 | 525 |

* Total for the year.

COST OF PRINTING FOR THE LIGHTHOUSE SERVICE DURING THE FISCAL YEAR 1914.

| | | | |
|-----------------------------|---------|------------------------------------|---------|
| Light lists..... | \$8,531 | Specifications and other publica- | |
| Buoy lists..... | 6,336 | tions..... | \$1,295 |
| Notices to mariners..... | 7,749 | Forms, reports, record books, etc. | 8,061 |
| Annual report, Part I..... | 659 | | |
| Annual report, Part II..... | 228 | Total..... | 32,859 |

MONEY RECEIVED BY THE LIGHTHOUSE SERVICE AND TURNED INTO THE TREASURY, FISCAL YEAR 1914.

| District. | From sales of vessels. | From sales of other property. | From damages to aids to navigation and other property. | From leases and rentals. |
|-----------|------------------------|-------------------------------|--|--------------------------|
| 2d..... | | \$2,244.97 | \$79.00 | \$61.00 |
| 3d..... | | 9,050.27 | 56.71 | 100.00 |
| 4th..... | | 787.07 | .84 | 5.00 |
| 5th..... | | 819.03 | 74.45 | 10.00 |
| 6th..... | | 1,471.40 | 16.78 | 3.00 |
| 7th..... | | 187.50 | | 515.00 |
| 8th..... | | 20.00 | 1,265.75 | 11.00 |
| 9th..... | | 101.50 | | |
| 10th..... | | | 30.22 | 150.00 |
| 11th..... | | 1,737.00 | 1,885.85 | 611.75 |
| 12th..... | | 2,171.60 | | |
| 14th..... | | 56.50 | | |
| 15th..... | | 182.31 | | |
| 16th..... | \$2,500.00 | 191.26 | | |
| 17th..... | | 1,241.29 | | 182.00 |
| 18th..... | | 381.30 | 91.33 | 1,758.30 |
| 19th..... | | 270.25 | | |

Total receipts, \$30,321.13.

APPROPRIATIONS FOR THE BUREAU OF LIGHTHOUSES AND THE LIGHTHOUSE SERVICE, SIXTY-THIRD CONGRESS, SECOND SESSION, 1913-14.

| Title. | Act. | Amount. |
|---|------------------------------|-----------|
| Maintenance: | | |
| Salaries, Bureau of Lighthouses, 1915..... | Legislative, July 16, 1914.. | \$64,030 |
| General expenses, Lighthouse Service, 1915..... | Sundry civil, Aug. 1, 1914.. | 2,775,000 |
| Salaries of keepers of lighthouses, 1915..... | do..... | 940,000 |
| Salaries, lighthouse vessels, 1915..... | do..... | 997,800 |
| Salaries, Lighthouse Service, 1915..... | do..... | 375,000 |
| Total for maintenance..... | | 5,151,630 |
| Special works: | | |
| Cape Cod Canal Lights..... | Sundry civil, Aug. 1, 1914.. | 50,000 |
| Staten Island Lighthouse Depot, N. Y..... | do..... | 23,000 |
| Aids to navigation, Alaska..... | do..... | 60,000 |
| Kauai Island Light Station, Hawaii..... | do..... | 3,000 |
| Total for special works..... | | 136,000 |
| Grand total..... | | 5,287,630 |

EXPENDITURES DURING THE FISCAL YEAR 1914 FROM APPROPRIATIONS FOR THE LIGHTHOUSE SERVICE.

[Obligations incurred are not included.]

MAINTENANCE APPROPRIATIONS.

| | |
|---|------------|
| Salaries: | |
| Bureau of Lighthouses, 1913..... | \$2,787.64 |
| Bureau of Lighthouses, 1914..... | 60,102.01 |
| Repairs and incidental expenses of lighthouses: Certified claims..... | 754.26 |
| Expenses of fog signals: Certified claims..... | 819.24 |
| Supplies of lighthouses: Certified claims..... | 13.51 |
| Salaries of keepers of lighthouses: | |
| 1912..... | 50.00 |
| 1913..... | 16,776.35 |
| 1914..... | 892,064.32 |
| Expenses of light vessels: Certified claims..... | .80 |
| Salaries, lighthouse vessels: | |
| 1912..... | 25.00 |
| 1913..... | 19,711.06 |
| 1914..... | 923,899.01 |

Salaries Lighthouse Service:

| | |
|-----------|------------|
| 1913..... | \$9,031.25 |
| 1914..... | 345,204.97 |

General expenses, Lighthouse Service:

| | |
|-----------|--------------|
| 1912..... | 89,220.21 |
| 1913..... | 516,580.67 |
| 1914..... | 2,290,069.39 |

| | |
|------------------------|--------------|
| Total maintenance..... | 5,166,609.39 |
|------------------------|--------------|

SPECIAL WORKS.**General:**

| | |
|--|-----------|
| Tender for first lighthouse district..... | 1,077.07 |
| Tender for fifteenth lighthouse district..... | 24,930.91 |
| Light vessels for general service..... | 58,052.25 |
| Oil houses for light stations..... | 11,767.93 |
| Storehouses for oil..... | 1,500.00 |
| Light keepers' dwellings..... | 2,381.28 |
| Relief of employees of the Lighthouse Service..... | 1,000.00 |
| Claims for damages by collision with lighthouse vessels..... | 97.88 |

| | |
|--|--------|
| First district: Monhegan Island Light Station, Me..... | 116.50 |
|--|--------|

Third district:

| | |
|--|----------|
| Tender for engineer, third lighthouse district..... | 2,867.87 |
| Staten Island and West Bank Light Station, N. Y..... | 2,614.35 |
| Staten Island lighthouse depot, N. Y. (power plant)..... | 410.18 |
| Staten Island lighthouse depot, N. Y. (wharves)..... | 25.54 |
| Negro Point Light Station, N. Y..... | 3,248.30 |
| Newark Bay beacon lights, N. J..... | 9,276.48 |
| Rondout Creek Light Station, N. Y..... | 25.50 |
| Point Judith Lighted Buoy, R. I..... | 2,202.66 |
| Repairs to lighthouse tender <i>Pansy</i> | 6,224.69 |

Fourth district:

| | |
|---|-----------|
| Miah Maull Shoal Light Station, Delaware River..... | 8,755.54 |
| Brandywine Shoal Light Station, Del..... | 53,049.68 |

Fifth district:

| | |
|--|-----------|
| Thimble Shoal Light Station, Va..... | 43,152.86 |
| Chesapeake Bay lighted buoys..... | 210.83 |
| Lighting Norfolk Harbor, Va..... | 14,137.76 |
| Fort McHenry Channel range lights, Md..... | 39,223.99 |

Sixth district:

| | |
|---|-----------|
| Cape Fear River range lights, N. C..... | 25,648.61 |
| Frying Pan Shoal Light Vessel, N. C..... | 576.00 |
| Tender for engineer, sixth lighthouse district..... | 715.00 |

Eighth district:

| | |
|---|-----------|
| Tender for inspector, eighth lighthouse district..... | 1,322.10 |
| Sand Island Light Station, Ala..... | 13,657.86 |
| Galveston Jetty Light Station, Tex..... | 505.07 |
| Southwest Pass Light Vessel, Mississippi River..... | 150.00 |

| | |
|--|----------|
| Ninth district: San Juan lighthouse depot, P. R..... | 9,424.04 |
|--|----------|

Tenth district:

| | |
|---|-----------|
| Buffalo Breakwater Light Station, N. Y..... | 36,702.17 |
| Point Abino Light Vessel, Lake Erie..... | 53,240.22 |
| Cleveland Fog-Signal Station, Ohio..... | 17.50 |
| Aids to navigation, Ashtabula Harbor, Ohio..... | 381.44 |
| Aids to navigation, Lorain Harbor, Ohio..... | 994.43 |

Eleventh district:

| | |
|--|-----------|
| Aids to navigation, St. Marys River, Mich..... | 55,625.22 |
| Aids to navigation, Ashland, Wis..... | 1,486.91 |
| Detroit River lights, Mich..... | 39,641.96 |
| Superior Pierhead Range Lights, Wis..... | 1,899.92 |

Twelfth district:

| | |
|---|----------|
| Oconto Harbor lights, Wis..... | 167.10 |
| Milwaukee Light Vessel, Wis..... | 2,379.20 |
| White Shoal Light Station, Lake Michigan..... | 8.75 |
| North Point Light Station, Wis..... | 66.00 |

Sixteenth district:

| | |
|---|----------|
| Aids to navigation, Alaska..... | 2,715.08 |
| Lincoln Rock Light Station, Alaska..... | 3,267.37 |
| Cape St. Elias Light Station, Alaska..... | 13.50 |

Seventeenth district:

| | |
|--|------------|
| Battery Point Fog Signal, Wash..... | \$673. 77 |
| Aids to navigation, Puget Sound, Wash..... | 5, 997. 58 |

Eighteenth district:

| | |
|--|------------|
| Point Loma Light Station, Cal..... | 327. 31 |
| Point Arena Light Station, Cal..... | 1, 417. 57 |
| San Pedro Breakwater Light Station, Cal..... | 138. 87 |

| | |
|--|---------|
| Nineteenth district: Kauai Island Light Station, Hawaii..... | 886. 34 |
|--|---------|

| | |
|---------------------------|--------------|
| Total, special works..... | 538, 337. 42 |
|---------------------------|--------------|

| | |
|--|-----------------|
| Total, maintenance appropriations..... | 5, 166, 609. 69 |
|--|-----------------|

| | |
|---------------------------|--------------|
| Total, special works..... | 538, 337. 42 |
|---------------------------|--------------|

| | |
|------------------|-----------------|
| Grand total..... | 5, 704, 947. 11 |
|------------------|-----------------|

ITEMIZED ESTIMATES OF APPROPRIATIONS FOR THE FISCAL YEAR 1916, AND ITEMIZED STATEMENT OF EXPENDITURES FOR THE FISCAL YEAR 1914, AS REQUIRED BY THE ACT OF CONGRESS APPROVED JUNE 25, 1910 (36 STAT., 755).

[The expenditures herein stated are in part estimated, owing to the fact that all obligations incurred for the year 1914 have not yet been settled. Articles of supplies purchased for general stock have also been distributed, approximately, to features to be benefited. This table refers to appropriations made in the sundry civil appropriation act and does not include Bureau salaries in Washington nor the cost of publications, otherwise provided for.]

| Items. | Estimate, 1916. | Expenditures, 1914. | Items. | Estimate, 1916. | Expenditures, 1914. |
|---|-----------------|---------------------|--|-----------------|---------------------|
| GENERAL EXPENSES, LIGHTHOUSE SERVICE. | | | GENERAL EXPENSES, LIGHTHOUSE SERVICE—contd. | | |
| Lights and fog signals: | | | Depots—Continued. | | |
| Rations and provisions..... | \$160,000 | \$158,188 | Repairs and improvements..... | \$130,000 | \$130,737 |
| Fuel and rent for keepers..... | 52,000 | 50,685 | Incidental expenses..... | 6,000 | 5,612 |
| General supplies..... | 195,000 | 193,043 | Offices: | | |
| Repairs and improvements, including grounds and outbuildings..... | 350,000 | 345,161 | Technical books and periodicals..... | 900 | 716 |
| Establishing lights and fog signals, including sites..... | 50,000 | 49,502 | Stationery and office supplies..... | 14,000 | 13,025 |
| Necessary additional land for light stations..... | 1,500 | | Telegraph and telephone..... | 7,500 | 7,178 |
| Oil and carbide houses..... | 2,000 | | Traveling expenses and mileage..... | 35,000 | 34,865 |
| Incidental expenses..... | 13,000 | 12,306 | Rent..... | 6,000 | 5,601 |
| Daymarks and spindles: | | | Freight, expressage, and cartage..... | 30,000 | 27,981 |
| Establishment, including sites..... | 4,000 | 3,772 | Incidental expenses..... | 2,500 | 2,450 |
| Repairs and improvements..... | 12,000 | 11,122 | Total..... | 2,843,000 | 2,746,907 |
| Incidental expenses..... | 100 | 105 | | | |
| Post lights: | | | SALARIES OF KEEPERS OF LIGHTHOUSES. | | |
| Establishment..... | 10,000 | 6,028 | Salaries of lighthouse keepers..... | 940,000 | 919,320 |
| Wages of laborers attending lights..... | 225,000 | 222,482 | | | |
| Supplies..... | 20,000 | 19,561 | SALARIES, LIGHTHOUSE VESSELS. | | |
| Repairs and improvements..... | 15,000 | 13,919 | Salaries and wages, lighthouse tenders..... | 670,000 | 620,102 |
| Incidental expenses..... | 1,000 | 928 | Salaries and wages, light vessels..... | 358,100 | 339,543 |
| Buoys: | | | Total..... | 1,028,100 | 959,665 |
| Establishment..... | 120,000 | 106,450 | | | |
| Supplies..... | 90,000 | 85,684 | SALARIES, LIGHTHOUSE SERVICE. | | |
| Repairs..... | 55,000 | 51,183 | Salaries, executive and technical..... | 145,000 | 137,105 |
| Incidental expenses..... | 500 | 272 | Salaries, clerical and messenger..... | 140,000 | 128,982 |
| Tenders: | | | Salaries, authorized depot force..... | 100,000 | 83,163 |
| Rations and provisions..... | 200,000 | 193,928 | Total..... | 385,000 | 349,250 |
| Supplies..... | 360,000 | 351,130 | | | |
| Repairs..... | 240,000 | 230,986 | | | |
| Incidental expenses..... | 6,000 | 6,100 | | | |
| Light vessels: | | | | | |
| Rations and provisions..... | 95,000 | 89,909 | | | |
| Supplies..... | 115,000 | 107,387 | | | |
| Repairs..... | 165,000 | 160,701 | | | |
| Incidental expenses..... | 5,000 | 4,983 | | | |
| Depots: | | | | | |
| Pay of laborers and mechanics..... | 40,000 | 38,025 | | | |
| Rent..... | 6,000 | 6,214 | | | |

SUMMARY OF ESTIMATES OF APPROPRIATIONS FOR THE LIGHTHOUSE SERVICE FOR THE FISCAL YEAR 1916.

FOR GENERAL MAINTENANCE OF THE LIGHTHOUSE SERVICE.

| | |
|---|--------------------|
| Salaries, Bureau of Lighthouses..... | \$64, 930 |
| General expenses, Lighthouse Service..... | 2, 840, 000 |
| Salaries, Lighthouse Service..... | 385, 000 |
| Salaries, keepers of lighthouses..... | 940, 000 |
| Salaries, lighthouse vessels..... | 1, 028, 100 |
| Total..... | 5, 258, 030 |

FOR SPECIAL WORKS.

Group 1. Works urgently necessary for the safety of navigation and for the preservation of existing structures or equipment, for the full utilization of other public improvements, or for the completion of projects already commenced:

| | |
|---|-----------------|
| 1. Lighthouse tender, general service, construction and equipment | 250, 000 |
| 2. Point Vicente, Cal., establishment of light and fog-signal station. | 80, 000 |
| 3. St. Johns River, Fla., aids to navigation..... | 66, 000 |
| 4. Woods Hole, Mass., improvements to lighthouse depot..... | 50, 000 |
| 5. Fighting Island Channel, Mich., aids to navigation..... | 25, 000 |
| 6. Guantanamo, Cuba, building keepers' dwelling and improving the lighting..... | 14, 000 |
| 7. Florida Reefs, Fla., aids to navigation..... | 75, 000 |
| 8. Hudson River, N. Y., aids to navigation..... | 100, 000 |
| 9. Mississippi River, La., aids to navigation..... | 50, 000 |
| 10. Conneaut, Ohio, light and fog signal, and improving present aids to navigation..... | 63, 500 |
| 11. Kellett Bluff, Wash., establishment of light and fog-signal station. | 40, 000 |
| 12. Coquille River, Oreg., aids to navigation..... | 6, 000 |
| 13. Toledo Harbor, Ohio, aids to navigation..... | 15, 000 |
| 14. Pearl Harbor, Hawaii, aids to navigation..... | 80, 000 |
| 15. Dog Island, Me., establishment of light..... | 3, 500 |
| Total, group 1..... | 918, 000 |

Group 2. Works considered essential for the immediate needs of navigation and for the efficient equipment of the Lighthouse Service:

| | |
|--|-----------------|
| 16. Sandy Hook, N. J., aids to navigation..... | 20, 000 |
| 17. Delaware River, Pa. and Del., aids to navigation..... | 80, 000 |
| 18. Detroit, Mich., improvements to lighthouse depot..... | 50, 000 |
| 19. Staten Island lighthouse depot, N. Y., improvement..... | 21, 000 |
| 20. Tender and barge for eighth lighthouse district, construction and equipment..... | 20, 000 |
| 21. Huron Harbor, Ohio, aids to navigation..... | 4, 500 |
| 22. Honolulu lighthouse depot, Hawaii, construction and equipment. | 90, 000 |
| 23. Point Borinquen Light Station, P. R., removal and rebuilding.. | 85, 000 |
| 24. Light keepers' dwellings, construction..... | 75, 000 |
| 25. Fairport, Ohio, aids to navigation..... | 30, 000 |
| 26. Sand Hills, Mich., establishment of light and fog-signal station.. | 75, 000 |
| 27. Manitowoc Breakwater Light Station, Wis., improvement..... | 25, 000 |
| Total, group 2..... | 575, 500 |

Group 3. Works considered essential for the needs of navigation and the equipment of the Lighthouse Service, and which it is recommended be undertaken as resources permit, are submitted with estimates of cost. (These items have been selected from a much larger number of recommendations submitted by the inspectors of the lighthouse districts and others.)

| | |
|---|----------|
| 28. Ludington, Mich., aids to navigation..... | 40, 000 |
| 29. Tampa Bay, Fla., aids to navigation..... | 12, 000 |
| 30. Keweenaw Waterway, Mich., aids to navigation..... | 110, 000 |

| | |
|---|------------------|
| 31. Light vessels for general Atlantic coast service..... | \$130,000 |
| 32. Light vessels for general lakes service..... | 150,000 |
| 33. Lighthouse tender for general service..... | 150,000 |
| 34. Goose Island Flats, N. J., establishment of light and fog-signal station..... | 120,000 |
| 35. Milwaukee, Wis., lighthouse depot, purchase of site and construction and equipment..... | 200,000 |
| 36. Alaska, lighthouse depot, purchase of site and construction and equipment..... | 40,000 |
| 37. Indian River, Fla., aids to navigation..... | 8,500 |
| 38. South Pass, La., light vessel..... | 125,000 |
| 39. Sand Island Light Station, Ala., improvements..... | 16,000 |
| 40. Point Pinos Light Station, Cal., improvement..... | 29,000 |
| 41. Milwaukee Pierhead Light Station, Wis., improvements..... | 25,000 |
| 42. Spectacle Reef Light Station, Mich., improvements..... | 17,500 |
| 43. Michigan Island, Wis., establishment of light and fog-signal station..... | 100,000 |
| 44. Kauhola Point Light Station, Hawaii, improvement..... | 15,000 |
| 45. Goat Island lighthouse depot, Cal., improvements..... | 43,000 |
| 46. Santa Barbara Light Station, Cal., improvements..... | 29,000 |
| 47. Cape Spencer, Alaska, establishment of light and fog-signal station..... | 100,000 |
| 48. Hilo, Hawaii, aids to navigation..... | 19,000 |
| 49. Portage Lake, Mich., establishment of light and fog-signal station and improvement of aids..... | 100,000 |
| 50. Ram Island, Me., establishment of light..... | 3,100 |
| 51. Cape Kumukahi, Hawaii, establishment of light..... | 24,000 |
| 52. Washington and Oregon, aids to navigation..... | 35,000 |
| 53. Henderson Point, Me., establishment of light and fog signal..... | 3,800 |
| 54. Port Real, P. R., establishment of light station..... | 34,000 |
| 55. Nine-Mile Point, Mich., establishment of light and fog-signal station..... | 50,000 |
| 56. Anacapa Island, Cal., establishment of light and fog-signal station..... | 103,000 |
| Total, group 3 (not included in total of estimates)..... | <u>1,831,900</u> |

RECAPITULATION.

| | |
|--|------------------|
| For general maintenance of the Lighthouse Service..... | 5,258,030 |
| For special works: | |
| Group 1..... | \$918,000 |
| Group 2..... | 575,500 |
| | <u>1,493,500</u> |
| Grand total..... | 6,751,530 |

DETAILED ESTIMATES FOR MAINTENANCE, 1916.

BUREAU OF LIGHTHOUSES.

| | |
|---------------|----------|
| Salaries..... | \$64,930 |
|---------------|----------|

GENERAL EXPENSES, LIGHTHOUSE SERVICE.

For supplies, repairs, maintenance, and incidental expenses of lighthouses and other lights, beacons, buoyage, fog signals, lighting of rivers heretofore authorized to be lighted, light vessels, other aids to navigation, and lighthouse tenders, including the establishment, repair, and improvement of beacons and day marks and purchase of land for same; the establishment of post lights, buoys, submarine signals, and fog signals; the establishment of oil or carbide houses not to exceed \$10,000: *Provided*, That no oil or carbide house erected hereunder shall exceed \$550 in cost; the construction of necessary outbuildings at a cost not exceeding \$200 at any one light station in any fiscal year; the improvements of grounds and buildings connected with light stations and depots; wages of laborers attending post lights; pay of temporary employees and field force while engaged on works of general repair and maintenance and pay of laborers and mechanics at lighthouse depots; rations and pro-

visions or commutation thereof for keepers of lighthouses, officers and crews of light vessels and tenders, and officials and other authorized persons of the Lighthouse Service on duty on board of such tenders or vessels; and money accruing from commutation for rations and provisions for the above-named persons on board of tenders and light vessels may be paid on proper vouchers to the person having charge of the mess of such vessels; reimbursement under rules prescribed by the Secretary of Commerce of keepers of light stations and masters of light vessels and of lighthouse tenders for rations and provisions and clothing furnished shipwrecked persons who may be temporarily provided for by them, not exceeding in all \$5,000 in any fiscal year; fuel and rent of quarters where necessary for keepers of lighthouses; the purchase of land sites for fog signals; the rent of necessary ground for all such lights and beacons as are for temporary use or to mark changeable channels and which in consequence can not be made permanent; the rent of offices, depots, and wharves; traveling expenses, including per diem in lieu of subsistence, under rules prescribed by the Secretary of Commerce, at not to exceed \$4 per day; and mileage, library books for light stations and vessels, and technical books and periodicals not exceeding \$1,000; and for all other contingent expenses of district offices and depots and for contingent expenses of the Office of the Bureau of Lighthouses in Washington, \$2,840,000.

Hereafter employees of the Lighthouse Service compensated at a per diem rate of pay may be granted 15 working days' leave of absence each year without forfeiture of pay during such absence, under rules prescribed by the Secretary of Commerce: *Provided*, That no employee of the class herein mentioned shall be entitled to any leave until he has served 12 consecutive months, when he may be granted 15 days' leave, and that during the second or any subsequent year 15 days' leave at the rate of one and one-fourth days per month, as earned, may be granted from the beginning of the second service year: *Provided further*, That the inspectors of the several lighthouse districts shall have discretion as to the time when the leave can be allowed without detriment to the Service, and that absence on account of sickness shall be deducted from the leave hereby granted.

Hereafter post-lantern lights and other aids to navigation may be established and maintained, in the discretion of the Commissioner of Lighthouses, out of the annual appropriations for the Lighthouse Service, on Lakes Okechobee and Hicpochee and connecting waterways across the State of Florida.

Hereafter appropriations made by Congress for the construction and equipment of vessels of the Lighthouse Service shall be available for the purchase or construction of suitable models of such vessels.

Hereafter the annual appropriations for the Lighthouse Service shall be available for defraying the expenses of cooperation between the Lighthouse Service and the Forest Service in the management of forest land on lighthouse reservations.

Hereafter the provisions of section 8 of the act of Congress approved August 24, 1912 (37 Stat., 487), relative to the administering of oaths to travel accounts or other expenses against the United States shall be extended to chief clerks in the offices of lighthouse inspectors or other employees in the Lighthouse Service designated by them, and hereafter chief clerks in offices of lighthouse inspectors and employees designated by them are authorized to administer oaths of office to employees of the Lighthouse Service.

The Secretary of Commerce is authorized to transfer the lighthouse property in lot 1, sec. 34, T. 22 N., R. 8 E, Iosco County, Mich., now a portion of the Tawas Lighthouse reservation to the Secretary of the Treasury for purposes of the life-saving service.

Hereafter the penalties provided in section 6 of the act of May 14, 1908 (35 Stat., 162), for obstruction or interference to any aid to navigation maintained by the Lighthouse Service shall apply with equal force and effect to any private aid to navigation lawfully maintained under the authority granted the Secretary of Commerce and the Commissioner of Lighthouses by section 6 of the act of June 20, 1906 (34 Stat., 324).

Hereafter the Secretary of Commerce is authorized, whenever he shall deem it advisable, to exchange any right of way of the United States in connection with lands pertaining to the Lighthouse Service for such other right of way as may be advantageous to the Service, under such terms and conditions as he may deem to be for the best interests of the Government; and in case any expenses are incurred by the United States in making such exchange, the same shall be payable from the appropriation "General expenses, Lighthouse Service," for the fiscal year during which such exchange shall be effected.

The Secretary of Commerce is hereby authorized, in his discretion, to use the unexpended balance of the appropriation of \$200,000 for a tender for the first lighthouse district and elsewhere made by the acts of May 27, 1908 (35 Stat., 331), and March 4,

1909 (35 Stat., 970), as modified by the act of July 27, 1912 (37 Stat., 238), for the construction of additional tenders for general service.

NOTE.—The amount estimated for \$465,000 in excess of the appropriation for the fiscal year 1914, consisting of the following items:

| | |
|--|----------|
| Leave of absence for per diem employees..... | \$15,000 |
| General increase of service..... | 50,000 |
| Total..... | 65,000 |

The item of \$15,000 for leave of absence of per diem employees is made necessary by the authority contained in the act of August 1, 1914 (Public No. 161, p. 56). A form of legislation to cover the matter in more precise terms is submitted in these estimates. It is believed that the granting of this leave would be of benefit to both the employees and the Lighthouse Service, but in order that the work of the Service may not be delayed, it is necessary to provide funds to meet this expense.

The further increase of \$50,000 is considered necessary on account of the increase in numbers of aids required for the safety of navigation and to keep the Lighthouse Service in an economical state of repair and efficiency. This increase of \$50,000 is 1.8 per cent over the appropriation last year, while the total number of aids was increased during the fiscal year 1914 from 13,521 to 14,198, an increase of 677, or 5.0 per cent. In order to keep pace with the constant development of commerce it is believed that proper provision for maintenance and repair as well as for the establishment of necessary additional minor aids frequently requested by mariners should be made. With the increasing numbers of requests for aids, it is impossible to render the full efficiency and service demanded unless adequate provision is made for funds.

In connection with the estimate of appropriation submitted herewith authority is requested to establish and maintain post lantern lights and other aids to navigation on Lakes Okechobee and Hicpochee and connecting waterways across the State of Florida. The lighting of rivers or inland waters is limited to those specifically authorized by Congress, and such authority has not been granted for the waters herein specified. Petitions of maritime interests in these localities have urged the establishment of lights, and investigation by the Lighthouse Service has found the same to be warranted.

Authority is also requested for the purchase or construction of suitable models of lighthouse vessels from appropriations made by Congress for the construction and equipment of such vessels. Such models would be useful in carrying out the construction of new vessels, as well as for other vessels of similar type to be constructed in the future.

Authority is also requested that the annual appropriations for the Lighthouse Service be made available for defraying the expenses of cooperation between the Lighthouse Service and the Forest Service in the management of forest land on lighthouse reservations. A number of lighthouse reservations on the Great Lakes either contain at present a considerable growth of timber, or are suitable for growing timber for sale commercially or for supplying the needs of the Lighthouse Service. An examination of a number of reservations by officers of the Forest Service and the Lighthouse Service has led to the formulation of a plan of cooperation whereby a systematic forest management might be established. With the gradual exhaustion of white cedar it is becoming more difficult to obtain the timber required for spar buoys, and it is estimated that by an expense of not over \$2,000 per year all forest areas on reservations on the Great Lakes may be brought to a productive state.

Authority is also requested that the provisions of section 8 of the act of August 24, 1912 (37 Stat., 487), relative to the administering of oaths to travel accounts or other expenses against the United States be extended to chief clerks in the offices of lighthouse inspectors, or other employees in the Lighthouse Service designated by them. It was understood at the time the act was approved that such authority was contained therein, but in an opinion dated October 23, 1912, the Comptroller of the Treasury held that the chief clerk of a department in Washington is not authorized to designate a clerk (not otherwise empowered) in a Government office outside of Washington to administer such oaths. On account of the wide scope of the Lighthouse Service and the isolation of many stations and vessels it is recommended that this authority be granted, to avoid the hardships and delays occasioned by the present requirements. The same conditions apply also to the administering of oaths of office to employees of the Lighthouse Service.

Authority is also requested for the transfer of a portion of the Tawas Lighthouse reservation, Michigan, to the Treasury Department for life-saving purposes. This land is not needed for the Lighthouse Service, and in a letter dated April 3, 1914, the Treasury Department stated that this portion affords the most suitable location on

Tawas Bay for the boathouse and launchways of the Tawas life-saving station. It is therefore recommended that Congress authorize the transfer of this portion of the reservation.

Authority is also requested that the penalties now provided for interference with aids to navigation maintained by the Lighthouse Service be extended to private aids lawfully maintained under proper authority. The law authorizing the establishment of private aids provides penalties for failure of the owners to maintain such aids properly, and it has been found that for lack of legal protection an owner may not be justly at fault for improper maintenance. It is therefore recommended, in equity to the owners, that the authority of the present statutes be extended to include protection to lawful private aids.

Regarding the proposed legislation for exchanges of rights of way, it is desirable from time to time for the best interests of the Lighthouse Service to exchange existing rights of way over land leading to lighthouse reservations for more direct or suitable rights of way; but there is no existing law authorizing such changes which it is now recommended that Congress grant in the authority requested above.

The act of July 27, 1912 (37 Stat., 970), authorized the use of the appropriation of \$200,000 for a tender for the first lighthouse district and elsewhere, made by the acts of May 27, 1908 (35 Stat., 331), and March 4, 1909 (35 Stat., 970), for the construction of two tenders. It is now thought that additional small tenders may be constructed out of this appropriation, and authority is requested to extend the unexpended balance of the appropriation for the construction of additional tenders for general service.

It is further recommended that consideration be given to the consolidation of the four general maintenance appropriations under the single appropriation "General expenses," by naming in the consolidated general appropriation a specific amount as the limit of all salary items included therein. It is believed that this step would effect a more economical and efficient administration of the Lighthouse Service by simplification of the accounting system, and permitting the costs of work to be kept in a more systematic and comprehensive manner, showing clearly for each principal feature the relative amounts paid for salaries, materials, supplies, equipment, and other component items. Among additional advantages of consolidation of items of general appropriation may be stated the following: (a) Laborers in charge of lights are now paid out of two different appropriations, those attending lights on rivers authorized by Congress to be lighted being paid out of general expenses, and those at other lights not on rivers being paid out of salaries of keepers; (b) commutation of rations of keepers and other employees (which may be properly considered as part of their compensation) now must be paid out of the appropriation "General expenses," while the salaries proper are paid out of the respective salary appropriations; (c) the items recommended for consolidation have natural limitations. For example, the number and average salary of keepers is limited by law. A necessary limitation is also imposed by the number of vessels in service. If such a consolidation of appropriations may be effected, it is believed that the total sum of the four general maintenance appropriations stated in these estimates, viz, \$5,193,100, may be reduced in the sum of \$25,000 to a revised total of \$5,168,100. This may be effected by reason of the fact that it is necessary to allow a small portion of each appropriation to be reserved for prevention of a deficiency prohibited by law, and if the appropriations be consolidated the amount reserved may be correspondingly reduced.

(See p. 542 for itemized estimate.)

SALARIES, KEEPERS OF LIGHTHOUSES.

For salaries of not exceeding 1,800 lighthouse and fog-signal keepers and laborers attending other lights, exclusive of post lights, \$940,000.

NOTE.—This is the same amount as appropriated for the fiscal year 1915.

(See p. 542 for itemized estimate.)

SALARIES, LIGHTHOUSE VESSELS.

For salaries and wages of officers and crews of light vessels and lighthouse tenders, including temporary employment when necessary, \$1,028,100.

NOTE.—The amount estimated for is \$30,600 in excess of the appropriation for the fiscal year 1915, consisting of the following items:

| | |
|---------------------------------|----------|
| Complements of new vessels..... | \$25,000 |
| Radio operators..... | 5,600 |
| Total..... | \$30,600 |

The item of \$25,000 arises from the fact that one new tender and three new light vessels are expected to go into commission during the fiscal year 1916, and complements based on those of similar classes should be provided for them.

The item of \$5,500 for radio operators is intended to provide for the additional employees required for proposed installations on lighthouse tenders, which is now proceeding, as funds become available. The moderate installation of such equipment is believed to be an urgent matter for the best efficiency of the Service.

(See p. 542 for itemized estimate.)

SALARIES, LIGHTHOUSE SERVICE.

For salaries of 17 lighthouse inspectors, and of clerks and other authorized permanent employees in the district offices and depots of the Lighthouse Service, exclusive of those regularly employed in the office of the Bureau of Lighthouses, Washington, D. C., \$385,000.

NOTE.—An increase of \$10,000 over the appropriation for the fiscal year 1915 is submitted, consisting of the following:

Additional clerks and draftsmen..... \$11,000

The item of \$10,000 is occasioned by the general growth of the Service in order that the technical and clerical work of the district offices may be dispatched promptly. About 10 positions at salaries ranging from \$900 to \$1,500 per annum will be thus provided for.

(See p. 542 for itemized estimate.)

DETAILED ESTIMATES FOR SPECIAL WORKS 1916.

GROUP No. 1.

Works urgently necessary for the safety of navigation and for the preservation of existing structures or equipment, for the full utilization of other public improvements, or for the completion of projects already commenced.

No. 1. *Lighthouse tender, general service.*—For constructing and equipping a lighthouse tender for general service, authorized by the act approved March 4, 1913 (37 Stat., 1017), \$250,000.

NOTE.—On May 20, 1912, the lighthouse tender *Armeria* struck a rock off Cape Hinchinbrook, Alaska, and was totally lost. This tender was the largest in the Lighthouse Service and the only one regularly assigned for service in Alaskan waters. The loss of this tender has seriously crippled the available tender force and a new tender should take its place as soon as possible. The lighthouse work is constantly increasing, on account of the increase of shipping and demand for aids to navigation.

Detailed estimate: Navy tugs built on Pacific coast under 10-hour day cost \$193.35 per ton, and two new revenue cutters built under 8-hour law cost \$215.51 per ton. It is believed the cost of the proposed vessel may be estimated at \$200 per ton. The maximum displacement of the *Armeria* was about 1,300 tons, which in the proposed vessel will be about 1,250 tons.

1,250 tons, at \$200..... '25,000

The act of March 4, 1913 (Public, No. 453), authorized the construction of a tender for general service at \$250,000, but no appropriation for this object has as yet been made.

No. 2. *Point Vincente, Cal., Light Station.*—For establishing a light and fog signal station at Point Vincente, Cal., \$80,000.

NOTE.—Point Vincente is the most prominent point of the California shore line between Point Loma and Point Conception, a distance of 220 nautical miles. Practically all steamer traffic on the Pacific coast south of San Francisco, both domestic and foreign, passes this point. There is at present no lighthouse on this point, but there is one at Point Fermin, 6½ miles southeastward. This point, however, is cut off from steamers approaching on the usual courses from the northward until within 4 miles of Point Vincente by that point itself. This leaves an unlighted gap of 32 nautical miles on the usual courses of coasting vessels between Point Hueme Light Station and Point Fermin Light Station. The Point Fermin light would be discontinued on the completing of this proposed light station, for the reason that with a light on Point Vincente and the new lighthouse at the entrance to San Pedro Harbor it would be no longer required. Freight and passenger traffic is very heavy along this part of the coast and will be materially increased with the opening of the Panama Canal. Point Vincente is a bold, rocky point and practically no warning can be had by the lead in approaching it in foggy weather, as the 100-fathom curve lies within one-half mile of the shore. The importance of this point is increased by the fact that it is a point of change of course for all passing traffic. Petitions dated September 21, 1907, September 3, 1909, and October 28, 1909, signed by masters and shipowners, requested that a light and fog signal be established at this point. It is proposed to establish a flashing light at an elevation of 170 feet, and a first-class compressed-air fog signal. Detailed estimate:

| | |
|---|----------|
| Tower, including site and water supply..... | \$31,000 |
| Illuminating apparatus..... | 5,500 |
| Fog-signal apparatus and building..... | 9,800 |
| Dwellings for three keepers..... | 19,000 |
| Outbuildings, fences, oil storage, piping, etc..... | 7,000 |
| Contingencies..... | 7,700 |
| Total..... | \$80,000 |

No. 3. *St. Johns River, Fla., aids to navigation.*—For improving the aids to navigation and establishing new aids on the St. Johns River, Fla., below Jacksonville, \$66,000.

NOTE.—The present project of the United States Engineers calls for a 30-foot low-water channel from the sea to Jacksonville, and is expected to be completed by July 1, 1915. The increased depth in this river means that vessels of increased size will use this port. It will, moreover, be more than ever necessary to follow the dredged channels closely. The present post lights along the edges of the channels, already a source of much trouble and expense on account of damage by collision, if retained, would have to be moved even closer to the channels and into depths of water in which it would prove impracticable to maintain them. The present post-lantern lights are confusing by reason of their low intensity and fixed characteristic, and the large number of them necessarily visible at one time. The amount of commerce on this river is large and increasing and fully warrants any reasonable expenditure to establish an efficient system of lighted aids. It is proposed to establish 36 range lights, 14 post lights, and 21 buoys to mark this tortuous channel properly. Detailed estimate:

| | |
|--------------------------------------|----------------|
| Foundations for 36 range lights..... | \$14, 400 |
| Towers for same..... | 3, 600 |
| Illuminating apparatus..... | 22, 000 |
| 14 post-light structures..... | 1, 400 |
| 16 gas buoys and appendages..... | 21, 600 |
| 5 nun buoys and appendages..... | 1, 000 |
| Contingencies..... | 2, 000 |
| Total..... | 66, 000 |

No. 4. *Woods Hole, Mass., lighthouse depot.*—For improvements at Woods Hole lighthouse depot, Mass., \$50,000.

NOTE.—This depot is well located and protected in all weathers, but the work is badly handicapped by there not being a sufficient depth of water for tenders and deep-draft light vessels. It is recommended that the channel and basin around the wharf be dredged to a depth of 17 feet at low water, and it is also recommended that a brick storehouse, 35 feet by 80 feet, two stories high, with a half-pitch roof be built to replace the wooden one, which is not at all adapted for the business, and not large enough to accommodate the stock on hand in proper manner. Under present conditions the tender *Anemone* requires a supply of buoys on the fish commission dock and on the wharf at New Bedford, thus having the supplies located in three different places. The *Azalea* is required to tend and wait on the *Anemone* when anything is required from the depot's stock. This operation seriously interferes with carrying on the work properly. The dock at the fish commission is in a very dilapidated condition, and it is only a matter of a short time when the *Anemone* will not be able to dock there or keep a working supply of buoys and appendages. The front of the wharf has already been taken away and the remainder will not last for any great length of time. Detailed estimate:

| | |
|--------------------------|----------------|
| Dredging channel..... | \$35, 000 |
| Building storehouse..... | 15, 000 |
| Total..... | 50, 000 |

No. 5. *Fighting Island Channel, Mich., aids to navigation.*—For improving aids to navigation and establishing new aids in the Fighting Island Channel, Detroit River, Mich., \$25,000.

NOTE.—The project for improvement of the lower Detroit River, contained in House Document No. 17, Sixty-second Congress, first session, for which an appropriation was made in the river and harbor act of March 4, 1913, is now in course of execution. This contemplates a straight channel after leaving the Grassy Island North Channel Range to the turn on to the Grosse Isle South Channel Range, a distance of some 5 miles. This will eliminate the necessity of both Mamajuda Range and Grassy Island South Channel Range, and necessitate the moving of both Ecorse Range, at the north end, and Grosse Isle North Channel Range, at the south, to proper sailing lines in the new channel.

The preferred scheme of lighting would be the establishment of separate ranges for up and down bound vessels, and of two or more side lights at about the present locations, on the west side of Grassy Island South and Mamajuda Ranges. Detailed estimate:

| | |
|---------------------------------------|----------------|
| Establishing new range lights..... | \$15, 000 |
| Moving present range lights..... | 5, 000 |
| Establishing side channel lights..... | 5, 000 |
| Total..... | 25, 000 |

No. 6. *Guantanamo, Cuba, aids to navigation.*—For dwelling for keepers of the lights in Guantanamo Bay, Cuba, and improving the lighting, \$14,000.

NOTE.—The act of July 27, 1912 (37 Stats., 239), authorized the construction of these works, but no appropriation was made therefor. The dwelling at this station was destroyed during the late insurrection, and since the occupation of Guantanamo by the United States the keepers have been compelled to live in a wooden shack with only three rooms to house three keepers. The lights in charge of these three keepers are widely separated. With the installation of acetylene lights as proposed, the service of one keeper may be dispensed with. Detailed estimate:

| | |
|--|----------------|
| Dwelling for two keepers..... | \$3, 000 |
| 2 acetylene lights at Fisherman Point..... | 2, 800 |
| 2 acetylene lights at Hicacal Beach..... | 2, 800 |
| Contingencies..... | 400 |
| Total..... | 14, 000 |

No. 7. *Florida Reefs, Fla., aids to navigation.*—For establishing additional lighted aids for Florida Reefs, and repairs and improvements to existing aids, \$75,000.

NOTE.—On account of the unusually difficult and dangerous conditions encountered by vessels navigating near the Florida Reefs, especially by vessels bound into the Gulf of Mexico, which pass close to the reef to avoid the adverse Gulf stream current, additional lighted aids are urgently needed. A very large commerce is carried on through the Straits of Florida and numerous strandings and wrecks, involving large losses, have occurred in the past, several within the last year. These reefs, owing to their nature, are a grave danger to navigation. They rise steeply from the deep channel of the Straits of Florida and the lead is, therefore, of little assistance. They lie far from shore, and at night the mariner must rely almost entirely upon artificial aids to guide him clear. It is, therefore, proposed to provide four intermediate lighted aids to be located about midway between present lights, which it is believed would greatly decrease the present dangers of navigation in that vicinity. Detailed estimate:

| | |
|---|----------|
| Skeleton towers in place, Molasses Reef and Pacific Reef, with iron-pile foundations..... | \$50,000 |
| Illuminating apparatus for Molasses Reef and Pacific Reef..... | 10,000 |
| Gas buoys for Coffins Patches and Looe Key..... | 10,000 |
| Repairs and improvements to existing aids..... | 5,000 |
| Total..... | 75,000 |

No. 8. *Hudson River, N. Y., aids to navigation.*—For improving the aids to navigation and establishing new aids on the Hudson River, N. Y., \$100,000.

NOTE.—The lighting on the river is obsolete and many of the existing aids are in poor condition from age and so constructed that it is impossible to keep them in operation when the ice commences to move, and, as navigation is frequently open for a month in the fall of the year under these conditions, it is a great inconvenience and danger to navigation. Many complaints have been received from pilots and officials of Hudson River steamers, and correspondence with them has indicated a number of points at which improvements or new aids are considered necessary. With the large amount of traffic on this river and the size of passenger steamers navigating it at night, it is believed that a modern system of flashing lights, on concrete foundations so as to resist ice damage, would be of great assistance to navigation. It is proposed to rebuild the light and fog signal at Stony Point, which is in poor condition and far from the edge of the channel, to improve existing aids at Staats Point, Lamphere Dock, Four Mile Point, West Flats, and Con Hook, by providing brighter and flashing lights, to increase candlepower and provide fog bell at Jeffreys Hook, to rebuild decayed foundations and provide new towers and brighter lights at Bear Island, Cow Island, Nine Mile Tree, Roha Hook, Five Hook Island, New Baltimore, Fitch's Wharf, Percy Reach, Catskill West Flats, Livingston Creek, Upper Coal Beds, and Esopus Island, to rebuild tower and fog-bell house and improve the light at West Point, and to establish new lights at Van Wies Point, Barrytown Bluffs, Magazine Point, and Anthony's Nose, improving in all 20 existing lights and establishing 4 new lights. The cost of providing and moving suitable construction plant has also been included. Detailed estimate:

| | |
|--|----------|
| Rebuilding Stony Point..... | \$15,000 |
| Improving Staats Point, etc., 5 lights, at \$2,500..... | 12,500 |
| Improving Jeffreys Hook with fog bell..... | 5,500 |
| Rebuilding and improving Bear Island, etc., 12 lights, at \$3,000..... | 36,000 |
| Rebuilding and improving West Point..... | 6,000 |
| Establishing Van Wies Point, etc., 4 lights, at \$4,000..... | 16,000 |
| Contingencies..... | 9,000 |
| Total..... | 100,000 |

No. 9. *Mississippi River, La., aids to navigation.*—For improving the aids to navigation and establishing new aids on the Mississippi River, below New Orleans, La., \$50,000.

NOTE.—It is proposed to establish about 22 acetylene lens-lantern lights on skeleton steel towers, to take the place of the inefficient oil post-lantern lights now shown from wooden posts. Vessels traverse the river, drawing 28 feet of water. The commerce of the river is large and important. From January 1 to December 31, 1913, 3,662 coastwise and foreign-bound vessels, with a tonnage of approximately 8,140,000, entered the port of New Orleans. The imports and incoming coastwise shipments during 1913 were valued at approximately \$101,000,000, and the exports and outgoing shipments approximately \$213,000,000, making a total value of \$314,000,000. Detailed estimate:

| | |
|------------------------------------|----------|
| 22 ramps and foundations..... | \$12,000 |
| 22 steel towers, 30 feet high..... | 9,000 |
| 22 illuminating outfits..... | 25,000 |
| Contingencies..... | 4,000 |
| Total..... | 50,000 |

No. 10. *Conneaut, Ohio, aids to navigation.*—For a light and fog signal and improving the present aids to navigation in Conneaut Harbor, Ohio, \$63,500.

NOTE.—Extensive improvements to enlarge this harbor, involving the construction of new breakwaters and pierheads, and the removal of the breakwater pierhead upon which the present Conneaut Harbor Front Range Light and Fog Signal is situated, have been authorized and the construction of the breakwaters is in progress. The west breakwater pierhead is under contract to be completed in August, 1914. The harbor improvement will necessitate a rearrangement of the aids to navigation and it is proposed to build a suitable structure for the main light on the pierhead, the light to be an oil vapor flashing light and the present fog bell, which is inadequate, to be replaced with a modern compressed-air siren. The commerce of Conneaut Harbor is extensive. The annual number of vessels entering and departing is about 3,000, representing a total registered tonnage of approximately 9,000,000. Detailed estimate:

| | |
|-----------------------------|---------------|
| Concrete base..... | \$20,000 |
| Riprap..... | 8,000 |
| Superstructure..... | 20,000 |
| Illuminating apparatus..... | 4,000 |
| Fog-signal apparatus..... | 8,000 |
| Boats, piping, etc..... | 3,500 |
| Total..... | 63,500 |

No. 11. *Kellett Bluff, Wash., Light Station.*—For establishing a light and fog-signal station at or near Kellett Bluff, Henry Island, Wash., or at some point on the west coast of San Juan Island, Wash., \$40,000.

NOTE.—The greater part of the commerce between Puget Sound and Alaska, and between Cape Flattery and points on the Gulf of Georgia, will be benefited by the establishment of a light and fog-signal station at this point. Vessels proceeding to the northward after leaving Point Wilson have a run of about 26 miles before reaching the proposed location, with no fog signal on the American side. The depths are too great for soundings and there are strong tidal currents of uncertain direction to contend with. A light and fog-signal station will provide a definite point to run for in going north through Haro Strait, and a definite point of departure for vessels bound across the treacherous eastern end of Juan de Fuca Strait for Puget Sound, or bound northward through Haro Strait. This location is where it is customary for vessels to change course. It is important to the mariner that he verify his position here or in this vicinity in order to avoid the dangers on both sides of this narrow strait. A flashing light and a reed-horn fog signal are recommended. There is a reservation of land for lighthouse purposes at Kellett Bluff, and another on the west coast of San Juan Island, about 5 miles distant. Detailed estimate:

| | |
|---|---------------|
| Fog-signal building and tower..... | \$12,000 |
| Dwellings for two keepers..... | 13,000 |
| Illuminating apparatus..... | 1,000 |
| Fog-signal apparatus..... | 4,000 |
| One derrick and hoisting engine..... | 1,000 |
| Oil house, outbuildings, boats, walks, etc..... | 5,400 |
| Contingencies..... | 3,600 |
| Total..... | 40,000 |

No. 12. *Coquille River, Oreg., aids to navigation.*—For improvement of aids to navigation at or near the entrance to Coquille River, Oreg., \$6,000.

NOTE.—Maritime interests have petitioned for the removal of the station to a more advantageous locality and much correspondence on the subject has been had during the past year. In its present location the light is of no great benefit to navigation, and the fog signal would serve its purpose better if on the other side of the river at or near the end of the south jetty. The station is on a point of land which is being encroached upon by the Coquille River. It is proposed to establish an occulting electric light and a fog bell operated by an electric motor at or near the end of the south jetty. A cottage for the keeper will be built near the inner end of the jetty on land formed by accretion since the construction of the jetty, or on a War Department reservation near by. The proposed change will effect an economy in the maintenance of the station, as only one keeper will be required instead of the present number of two. Detailed estimate:

| | |
|------------------------------------|--------------|
| Fog-signal building and tower..... | \$1,500 |
| Dwelling for keeper..... | 2,500 |
| Illuminating apparatus..... | 200 |
| Fog-signal apparatus..... | 800 |
| Electric wiring and poles..... | 750 |
| Contingencies..... | 50 |
| Total..... | 6,000 |

No. 13. *Toledo Harbor, Ohio, aids to navigation.*—For improving the aids to navigation in Toledo Harbor, Ohio, \$15,000.

NOTE.—The Manhattan Range Lights, marking the axis of the Maumee Bay straight channel leading to Toledo, should be clearly visible after passing the Maumee Bay Range Lights for a distance of about 5 miles. The present lights are too low and are frequently obscured by smoke. They are also sometimes blanketed by vessels mooring in the lagoon. These lights should therefore be raised in order to give greater efficiency. The present wooden towers are not structurally adapted for raising, and it is proposed to replace them with steel towers. Detailed estimate:

| | |
|---------------------------------------|---------------|
| Two steel towers, metal work..... | \$10,000 |
| Foundations..... | 2,000 |
| Erection, painting, installation..... | 1,500 |
| Contingencies..... | 1,500 |
| Total..... | 15,000 |

No. 14. *Pearl Harbor, Hawaii, aids to navigation.*—For establishing aids to navigation in Pearl Harbor, Hawaii, \$30,000.

NOTE.—In view of the fact that the Government has authorized the establishment of a naval station at this point, it is important that the channels and entrance be properly marked; this is rendered more important by the set of the current, which is usually across the channel in the approach, and also on account of the prevailing northeasterly winds. The necessary aids to navigation should be available at the completion of the harbor improvements. It is proposed to establish 9 lighted and 9 unlighted beacons, also 2 gas

buoys at the entrance. The Secretary of the Navy, by letter of August 12, 1893, requested favorable consideration for the establishment of suitable aids to navigation in Pearl Harbor. Detailed estimate:

| | |
|--|-----------------|
| 1 gas lighted buoys..... | \$10,000 |
| 4 lighted beacons in exposed waters, at \$5,000..... | 22,400 |
| 5 lighted beacons in unexposed waters, at \$3,500..... | 17,500 |
| 2 unlighted beacons in exposed waters, at \$4,000..... | 8,000 |
| 7 unlighted beacons in unexposed waters, at \$2,100..... | 14,700 |
| Contingencies..... | 7,400 |
| Total..... | \$80,000 |

No. 15. *Dog Island, Me., light.*—For establishing a light at or near Dog Island entrance to St. Croix River, Me., \$3,500.

NOTE.—Several wrecks have occurred in this vicinity. The mean rise and fall of the tide is about 13 feet; and about 125,000 tons of freight are carried annually by this locality, in addition to frequent passenger service daily. It is recommended that an acetylene light with colored sector be established in the vicinity of Dog Island. Detailed estimate:

| | |
|-----------------------------|----------------|
| Tower, including site..... | \$2,000 |
| Illuminating apparatus..... | 1,500 |
| Total..... | \$3,500 |

Total group No. 1, \$918,000.

GROUP NO. 2.

Works considered essential for the immediate needs of navigation, and for the efficient equipment of the Lighthouse Service:

No. 16. *Sandy Hook, N. J., aids to navigation.*—For improving the aids to navigation at Sandy Hook, N. J., \$20,000.

NOTE.—North Hook Beacon Light and Fog Signal, N. J., are at present so located in front of the batteries at Fort Hancock, Sandy Hook, N. J., as to interfere very seriously with the gun fire of several of the batteries, and absolutely prohibits the training of the guns on the range; covering the entrances to New York Harbor. The matter has been carefully investigated by representatives of the War Department and of the Lighthouse Service, and the views of maritime interests obtained relative to the best methods of making the necessary changes. It is recommended that the keepers' quarters, light, and fog signal be moved to a new location out of range of the batteries. Detailed estimate:

| | |
|---|-----------------|
| Moving and raising light, with new foundation..... | \$7,000 |
| Building new fog-signal house and moving engines..... | 5,000 |
| Moving, relocating, and repairing three keepers' dwellings..... | 6,000 |
| Contingencies..... | 2,000 |
| Total..... | \$20,000 |

No. 17. *Delaware River, Pa. and Del., aids to navigation.*—For improving the aids to navigation and establishing new aids on the Delaware River, Pa. and Del., \$80,000.

NOTE.—The United States Engineer's Office is now dredging a new 35-foot channel in the vicinity of Schooner Ledge, Delaware River. This channel will probably be completed during the present calendar year, and will require two ranges in place of the present Schooner Ledge Range. It is proposed to mark the new ranges as follows: Chester (Upper) Range, oil-vapor rear light on present reservation, acetylene front light in the water, out of the way of heavy ice; electric fog bell to be provided at the front light; Marcus Hook (Lower) Range to be similar, except that a site will be required for the rear light and no fog bell will be needed at the front light. Detailed estimate:

| | |
|--|-----------------|
| Chester Rear: | |
| Tower on pile and concrete foundation..... | \$15,000 |
| Removal of old and display of temporary light..... | 1,000 |
| Dwelling on pile and concrete foundation..... | 8,000 |
| Elevated walks on pile foundations..... | 4,000 |
| | \$28,000 |
| Chester Front: | |
| Tower and foundation..... | 9,000 |
| Illuminating apparatus..... | 2,000 |
| Fog-signal apparatus..... | 2,000 |
| Riprap..... | 2,000 |
| | 15,000 |
| Marcus Hook Rear: | |
| Site and right of way..... | 6,000 |
| Tower, including dwelling..... | 12,000 |
| Illuminating apparatus..... | 3,000 |
| Oil house and outbuildings..... | 1,500 |
| Grading roads, fences, etc..... | 1,500 |
| | 24,000 |
| Marcus Hook Front: | |
| Tower and foundation..... | 9,000 |
| Illuminating apparatus..... | 2,000 |
| Riprap..... | 2,000 |
| | 13,000 |
| Total..... | \$60,000 |

No. 18. *Detroit, Mich., lighthouse depot.*—For improvements at Detroit, Mich., lighthouse depot, \$50,000.

NOTE.—The following improvements are needed:

Oil house: The arrangements for storage of oil at this depot are very inadequate and unsatisfactory, and oil is stored in one wing of the basement of the main storehouse. The capacity is, however, insufficient, making it necessary to store large quantities of oil in the depot yard, exposed to possible damage or total destruction by fire, owing to the proximity of a varnish works. Furthermore, the handling of oil would be greatly facilitated, as the new structure could be so located as to handle the oil directly from the cars.

Addition to lamp shop: The present lamp shop is greatly overcrowded, owing to the increasing number of lighted buoys and other aids in the district, necessitating a greater and increasing quantity of parts returned for repair. Spare parts can not be accommodated but must be stored in the main storehouse, inconveniently located for the work. It is necessary to do a great deal of blacksmith repair work to moorings of buoys, etc., at the depot during the closed season of navigation, and this work must now be done in the open part of the buoy shed under very severe weather conditions during the winter or at times delayed until the severe storms are over.

Storehouse for cement and lime: Owing to the large amount of construction and repair work necessary in this district, a considerable quantity of cement and lime must be kept on hand. A small building for this storage should be provided.

Reconstruction of wharf: The wharf here has undergone for many years only such repair as necessary to render it serviceable. It is an old wooden structure on cast-iron columns standing on piles cut off about a foot below water level. It should be rebuilt and extended out to the pier line to give additional capacity.

Detailed estimate:

| | |
|------------------------------|---------|
| Oil house..... | \$4,000 |
| Addition to lamp shop..... | 5,000 |
| Cement and lime storage..... | 2,000 |
| Reconstruction of wharf..... | 35,000 |
| Contingencies..... | 4,000 |
| Total..... | 50,000 |

No. 19. *Staten Island, N. Y., lighthouse depot.*—For improvement of the offices and laboratory at the general lighthouse depot, Tompkinsville, Staten Island, N. Y., \$21,000.

NOTE.—The present office quarters and laboratory at the general depot, Tompkinsville, N. Y., are located in four detached buildings, giving rise to delay and confusion in the orderly handling of work, as well as causing unnecessary expense of heating and other maintenance items. It is proposed to construct an addition which will join three of the present buildings, and make it possible to use the space so gained for the improvement of the laboratory, which is now located in the fourth building. This building is poorly adapted for laboratory purposes, but can be put to good use as a storehouse, which is also needed on account of the growth of the service. Detailed estimate:

| | |
|------------------------------------|---------|
| Altering old buildings..... | \$4,500 |
| Foundation..... | 1,500 |
| Walls, rough floors, and roof..... | 8,000 |
| Interior finish, etc..... | 5,000 |
| Contingencies..... | 2,000 |
| Total..... | 21,000 |

No. 20. *Eighth lighthouse district, tender and barge.*—For constructing, or purchasing, and equipping a small tender and barge for eighth lighthouse district, Texas and Louisiana, \$20,000.

NOTE.—The tender for the eighth lighthouse district, Texas and Louisiana, which should be a motor launch about 65 feet long, and barge to be equipped with derrick pile driver, neither to exceed 3 feet draft, are absolutely necessary for establishing and maintaining lights and daymarks along the inter-coastal canals and other shallow waters of the eighth lighthouse district. That portion of the canal from Galveston, Tex., to Corpus Christi, Tex., has been completed by the War Department, and in the next year or two the canal will be open to the Mississippi River. Detailed estimate:

| | |
|--------------------------------|----------|
| Motor launch..... | \$15,000 |
| Pile driver derrick barge..... | 5,000 |
| Total..... | 20,000 |

No. 21. *Huron, Ohio, aids to navigation.*—For establishing aids to navigation at Huron Harbor, Ohio, \$4,500.

NOTE.—The act of June 17, 1910, authorized the establishment of range lights at Huron Harbor, at a cost not to exceed \$3,800, but no appropriation for the object has been made. The erection of a rear range light to serve with the present Huron Light will accomplish the desired object, but provision should also be made for a fog bell at the front light. The commerce of Huron Harbor is important, consisting principally of ore and fish incoming and coal outgoing. Over 300 vessels with a registered tonnage of over 640,000, enter the harbor annually, with a cargo valuation of approximately \$3,000,000. Detailed estimate:

| | |
|-----------------------------|---------|
| Tower..... | \$1,500 |
| Illuminating apparatus..... | 1,800 |
| Fog-signal apparatus..... | 1,200 |
| Total..... | 4,500 |

No. 22. *Hawaiian Islands, lighthouse depot.*—For the construction and equipment of a lighthouse depot for the nineteenth lighthouse district, \$90,000.

NOTE.—The greatest need in this district is an adequate lighthouse depot. At present the stores are kept in two small, overcrowded, leaky storerooms on the Channel Wharf, Honolulu, where they are in danger of fire on account of proximity to fishing sampans, which are careless in the handling of gasoline. The heavy stores are kept in a large room adjoining the storage rooms occupied as a depot on Channel Wharf, lately vacated by the Territory because of the condemnation of the wharf. Buoys are kept some on Channel Wharf and some on Naval Wharf No. 1. The heavier buoys can not be kept on the Channel Wharf on account of its dilapidated condition, and when placed on the Naval Dock are exposed to the weather and are frequently covered with coal when warships are coaling. In assembling materials for any construction work it has been the custom to collect them at the Channel Wharf, and if there is any considerable amount that wharf becomes filled up, necessitating the removal of the material on account of inconvenience to other users. Hence, the lack of a depot results in much inefficiency in collecting materials as well as inconvenience and annoyance. The fact that the temporary wharf and storehouse are in a bad state of repair, having been condemned about a year ago, makes the situation very uncertain and unsatisfactory. Application for the transfer of Naval Wharf No. 3 and of a piece of land (1.2 acres) contiguous to this wharf has been made to the Navy Department. It is proposed to erect adequate buildings and improvements on this site for lighthouse-depot purposes. Detailed estimate:

| | |
|---|---------------|
| Repairs and enlargement of wharf..... | \$30,000 |
| General storehouse..... | 28,000 |
| Repair plant equipment..... | 10,000 |
| Carbide and oil house..... | 2,000 |
| Office building..... | 10,000 |
| Improvement of grounds, including walks, fences, etc..... | 2,000 |
| Contingencies..... | 8,000 |
| Total..... | 90,000 |

No. 23. *Point Borinquen, P. R., Light Station.*—For the removal and rebuilding on another site of the light station and dwelling at or near Point Borinquen, P. R., \$85,000.

NOTE.—The present Point Borinquen Lighthouse is improperly located at the foot of a bluff 280 feet high, which obscures the light in the northeasterly direction. To the southward, plantations of high trees obscure the light in its most desirable direction, the harbor of Aguadilla. The present tower is in bad state of repair, the top part being considered unsafe and the foundation insecure. At the present time the light is inadequate, and with the opening of the Panama Canal it will be quite insufficient, as it will then become a most important landfall light. In addition to the light, and in connection with it, it is proposed to install a wireless station which will send automatically the wireless name of the station, which will give vessels an opportunity to locate their position when distant from the shore. Detailed estimate:

| | |
|--------------------------------------|---------------|
| Tower, including site..... | \$30,000 |
| Dwelling for three keepers..... | 20,000 |
| Illuminating apparatus..... | 7,000 |
| Power house and wireless outfit..... | 4,500 |
| Outbuildings, piping, etc..... | 8,000 |
| Roads and grounds..... | 7,000 |
| Contingencies..... | 8,500 |
| Total..... | 85,000 |

No. 24. *Light keepers' dwellings.*—For light keepers' dwellings and appurtenant structures, including sites therefor, within the limit of cost fixed by act approved February 26, 1907, \$75,000.

NOTE.—The appropriations made March 4, 1907 (34 Stat., 1319), and May 27, 1908 (35 Stat., 334), of \$75,000 each, are now exhausted, but dwellings at a number of stations are yet needed, among which may be stated: Amelia Island, Fla.; Ano Nuevo Island, Cal.; Buffalo Breakwater, N. Y.; Charlotte, N. Y.; Dry Tortugas, Fla.; Frankfort, Mich.; Oswego Breakwater, N. Y.; Piedras Blancas, Cal.; Point Hueneme, Cal.; Point Montara, Cal.; Point Sur, Cal.; Port San Juan, P. R.; Sand Island, Ala.; Tawas, Mich.; Toledo Harbor, Ohio; Two Harbors, Minn. Detailed estimate:

| | |
|-------------------------------|---------------|
| 16 dwellings, at \$4,500..... | \$72,000 |
| Contingencies..... | 3,000 |
| Total..... | 75,000 |

No. 25. *Fairport, Ohio, aids to navigation.*—For improving the aids to navigation at Fairport Harbor, Ohio, \$30,000.

NOTE.—The completion of the west breakwater pierhead necessitates a rearrangement of the aids to navigation at this harbor. It is proposed to discontinue the present main light on the bluff and to construct the new light on the pierhead. The west breakwater and pierhead have been completed, and on the east side the breakwater has been built up to the water line throughout its length and the pierhead crib has been placed. The annual number of vessels entering and departing is about 1,300, representing a total registered tonnage of approximately 3,000,000. Detailed estimate:

| | |
|-----------------------------|---------------|
| Structure..... | \$20,000 |
| Illuminating apparatus..... | 6,500 |
| Boats, piping, etc..... | 3,500 |
| Total..... | 30,000 |

No. 26. Sand Hills, Mich., Light Station.—For establishing a light station and fog signal at or near Sand Hills, Mich., \$75,000.

NOTE.—A light and fog-signal station at Sand Hills, about 4 miles west of Eagle River, Keweenaw Peninsula, Lake Superior, would be of great service to vessels bound east from the western portion of Lake Superior in warning vessels from the dangerous reefs off the coast. It is reported that 10 vessels stranded on these reefs in recent years, with known losses of over \$1,000,000. Detailed estimate:

| | |
|------------------------------------|---------------|
| Tower..... | \$30,000 |
| Fog signal..... | 12,000 |
| Quarters for three keepers..... | 15,000 |
| Outbuildings, dock, boat, etc..... | 10,000 |
| Contingencies..... | 8,000 |
| Total..... | 75,000 |

No. 27. Manitowoc Breakwater, Wis., Light Station.—For improving the light and fog-signal station at Manitowoc North Breakwater, Wis., \$25,000.

NOTE.—The present frame building with corrugated iron covering, with very small wooden lantern (not large enough to admit a man) stands on the outer end of the North Breakwater, which is of stone-filled timber construction. The building is old and in poor condition. The timber sills supporting the building are badly rotted. The other timber work is deteriorating. Covering plates are rusting and breaking away at bottom. Cement floor is cracked and the building itself is shaky, due to movement and settlement of pier and to the fact that the building has been moved twice. It is liable to destruction in its exposed position and should be replaced at an early date with a steel building on a concrete base. It is proposed to install electric-driven air compressor, obtaining current from the city, with oil engine reserve drive, and to provide a brighter light. Detailed estimate:

| | |
|--|---------------|
| New fog-signal building, with lantern..... | \$12,000 |
| Fog-signal apparatus..... | 9,000 |
| Illuminating apparatus..... | 1,500 |
| Contingencies..... | 2,500 |
| Total..... | 25,000 |

Total, group No. 2, \$575,500.

Total of groups Nos. 1 and 2, \$1,493,500.

GROUP NO. 3.

Works considered essential for the needs of navigation and the equipment of the Lighthouse Service, and which it is recommended be undertaken as resources permit, are submitted with estimates of cost. (These items have been selected from a much larger number of recommendations submitted by the inspectors of the lighthouse districts and others.)

No. 28. Ludington, Mich., aids to navigation.—For improving the aids to navigation and establishing new aids at Ludington, Mich., \$40,000.

NOTE.—The present location of the fog-signal station on the end of south pier subjects vessels to danger of striking the breakwater. The commerce of Ludington, which includes important car ferry lines across Lake Michigan, is more important than any other port on the east shore of Lake Michigan, and as this port is most inadequately lighted now this improvement is considered well warranted. It is proposed to establish a main light on the outer end of the north breakwater, with fog-signal apparatus, consisting of electrically driven air compressor and siren with oil engine reserve drive, and to discontinue the present steam fog signal in old wooden structure. Quarters for keepers should be erected adjacent to the light, as it is unsafe to cross the harbor during the winter when the ice is broken up by car ferries. Detailed estimate:

| | |
|---|---------------|
| Foundation..... | \$5,000 |
| Fog-signal building..... | 5,000 |
| Illuminating apparatus..... | 3,000 |
| Fog-signal apparatus..... | 9,000 |
| Quarters for three keepers, including site..... | 10,000 |
| Minor lights on south breakwater..... | 3,000 |
| Contingencies..... | 5,000 |
| Total..... | 40,000 |

No. 29. Tampa Bay, Fla., aids to navigation.—For establishing and improving aids to navigation in Tampa Bay, Fla., \$12,000.

NOTE.—Tampa is an important seaport with a large and growing commerce by sea. Owing to shallow water in Tampa Bay, deep-draft vessels can reach the city from the Gulf only by means of several comparatively narrow dredged cuts. Provision has already been made for lighting all of the important cuts excepting Cut D, for which lights should be provided as soon as practicable, as large vessels must pass through this cut in order to reach Port Tampa. Detailed estimate:

| | |
|-----------------------------|---------------|
| Concrete foundation..... | \$2,000 |
| Metal work towers..... | 5,000 |
| Illuminating apparatus..... | 4,000 |
| Contingencies..... | 1,000 |
| Total..... | 12,000 |

No. 30. *Keweenaw Waterway, Mich., aids to navigation.*—For establishing and improving aids to navigation at or near the entrance to Keweenaw Waterway Harbor of Refuge, Portage River, Mich., \$110,000.

NOTE.—The improvements by the War Department are now in progress and will probably be carried through to completion at an early date. Steps should be taken as soon as possible by the Lighthouse Service looking to the proper lighting of the entrance under the new conditions. It is recommended that a light and fog signal be erected on a separate foundation on the outer end of the breakwater, and that six nonattended lights be established to mark the harbor, and, as the work will necessitate changes at the locality, that present range lights Nos. 1 and 2 be rebuilt and provided with gas appliances. The Portage River (Main) Light may be discontinued on the completion of this project, and the dwelling retained as shore station for one keeper. Detailed estimate:

| | |
|---|----------|
| Foundation and concrete base for tower..... | \$43,000 |
| Superstructure..... | 24,000 |
| Illuminating and fog-signal apparatus..... | 9,000 |
| Establishing six minor lights..... | 24,000 |
| Rebuilding lights Nos. 1 and 2..... | 6,000 |
| Contingencies..... | 4,000 |

Total..... 110,000

No. 31. *Light vessel for general Atlantic coast service.*—For constructing and equipping a light vessel for general service on the Atlantic coast, \$130,000.

NOTE.—A number of the 66 light vessels now in the Lighthouse Service are more than 50 years old. To relieve these vessels for necessary repairs and overhauling and to place the older ships on less exposed stations, it is necessary that new vessels be gradually added to the fleet. It is proposed to construct a first-class full-powered vessel, with modern light, fog-signal, and radio apparatus, suitable for outside service on the Atlantic coast.

No. 32. *Light vessels for general Lake service.*—For constructing and equipping light vessels for general service on the Great Lakes, \$150,000.

NOTE.—Light vessels Nos. 55, 56, 57, 60, 61, and 62, now stationed on the Great Lakes, are all old, built of wood, and are rapidly deteriorating. Light vessel No. 59 has, during the summer of 1914, been condemned as unseaworthy, and was removed from her station at Poe Reel, southern entrance to Straits of Mackinac, Mich. Of the others, light vessels Nos. 61 and 62 are in especially bad condition, and can not be depended upon for service in the stormy fall season. It is proposed to construct two or more vessels, similar in type to those recently built for Lake service, of steel, and fitted with modern light and fog-signal apparatus.

No. 33. *Lighthouse tender for general service.*—For constructing and equipping a light house tender for general service, \$150,000.

NOTE.—On account of the increasing work of the lighthouse service, and the fact that a number of the 45 tenders now in service are quite old, it is important that new tenders be gradually constructed to replace those worn out in service. It is proposed to construct a medium-draft vessel, suitable for both harbor and outside work, with the necessary appliances for handling heavy buoys, and other work of the Service.

No. 34. *Goose Island Flats, N. J., Light Station.*—For establishing a light and fog signal at or near Goose Island Flats, N. J., \$120,000.

NOTE.—Vessels navigating the Delaware River are obliged to make a decided turn at this point. A temporary structure, protected by riprap, was carried away by the ice in January, 1910, although the riprap is partially in place and forms a menace to navigation unless properly marked. A buoy is now maintained at this location, but in winter it is impossible to keep it in position on account of the heavy ice. It is proposed to erect a light and fog signal, on a suitable heavy caisson foundation, close to the channel on the easterly side. Detailed estimate:

| | |
|------------------------------------|----------|
| Foundation in place..... | \$65,000 |
| Metal work for superstructure..... | 15,000 |
| Erection of superstructure..... | 20,000 |
| Illuminating apparatus..... | 3,000 |
| Fog signal apparatus..... | 5,000 |
| Contingencies..... | 9,000 |

Total..... 120,000

No. 35. *Milwaukee, Wis., lighthouse depot.*—For the purchase or improvement of a site, the construction of a wharf and buildings, and the necessary equipment for a lighthouse depot, Milwaukee, Wis., and proceeds from sale of present depot, shall be available for purposes of this appropriation, \$200,000.

NOTE.—The present depot at Milwaukee is practically surrounded by coal yards, except on the water front, and the nuisance from the coal dust makes it impossible to keep either stores or machinery in good condition. Consideration has been given to obtaining a new site which will avoid this trouble, which it is believed should be located farther up the Kinnickinnic River. Milwaukee is considered to be the logical point for the location of the principal depot of the twelfth lighthouse district, Lake Michigan and Green Bay, on account of being the leading Lake port in the district in point of commerce. Detailed estimate:

| | |
|--|----------------|
| Purchase or improvement of site..... | \$85,000 |
| Storehouse..... | 60,000 |
| Wharves and revetments..... | 50,000 |
| Buoy platform, pavements, and walks..... | 15,000 |
| Oil house, fencing, and transfer of equipment..... | 10,000 |
| Keepers' dwelling..... | 7,000 |
| Contingencies..... | 23,000 |
| Total..... | 250,000 |
| Estimated proceeds present depot..... | 50,000 |
| Total amount needed..... | 200,000 |

No. 36. *Alaska, lighthouse depot.*—For the purchase of a site for a lighthouse depot and the necessary equipment so far as funds may permit for the sixteenth lighthouse district, \$40,000.

NOTE.—There is no lighthouse depot in Alaska, and the work of the lighthouse service is considerably handicapped by the lack of such facilities. Temporary quarters are now rented at \$325 per month, which would be unnecessary if proper facilities were owned by the Government. It is not intended at this time to erect office quarters, etc., for which further arrangements in other Federal buildings may be made in the future. Detailed estimate:

| | |
|------------------------------------|---------------|
| Purchase of site..... | \$20,500 |
| Repairs, equipment, dock, etc..... | 19,500 |
| Total..... | 40,000 |

No. 37. *Indian River, Fla., aids to navigation.*—For improving the aids to navigation and establishing new aids on the Indian River, Fla., \$8,500.

NOTE.—There has been a demand for lights on this river for some time past, and the traffic thereon has increased considerably. The river is navigable for light-draft vessels for a distance of over 100 miles, and it has been improved by dredging in many places under authority of Congress. It is proposed to establish about 30 lights, which it is believed will be sufficient for the purpose. Detailed estimate:

| | |
|---|--------------|
| 30 pile dolphins..... | \$3,750 |
| 20 oil lights..... | 350 |
| 10 acetylene lights (for the more isolated localities)..... | 3,500 |
| Contingencies..... | 900 |
| Total..... | 8,500 |

No. 38. *South Pass, La., light vessel.*—For constructing and equipping a light vessel for South Pass entrance to Mississippi River, La., \$125,000.

NOTE.—The act of October 22, 1913 (38 Stat., 224) appropriated \$125,000 for a light vessel for Southwest Pass, but did not provide for South Pass, where there is urgent need for a similar vessel, as both passes are open and used. In the year 1913 over 3,600 vessels, with a tonnage of over 8,000,000, entered the port of New Orleans, and the total value of imports and exports during that period was over \$314,000,000. It is proposed to construct a steel self-propelling vessel equipped with modern light and fog-signal apparatus, similar to that authorized for Southwest Pass.

No. 39. *Sand Island Light Station, Ala.*—For improving Sand Island Light Station, Ala., \$16,000.

NOTE.—In October, 1906, a storm destroyed the dwelling at this station, and since that time the keepers have used the tower as a dwelling. These quarters are not suitable, and it is recommended that a dwelling be erected. There is great need for a fog signal at this station, which at present has none. Fog prevails for a large portion of the winter and spring season, making the entrance to Mobile Bay difficult and dangerous at times. It is recommended that the station be equipped with modern fog-signal apparatus. Detailed estimate:

| | |
|---------------------------------|---------------|
| Dwelling for three keepers..... | \$6,500 |
| Fog signal building..... | 2,500 |
| Fog-signal apparatus..... | 7,000 |
| Total..... | 16,000 |

No. 40. *Point Pinos, Cal., Light Station.*—For improving Point Pinos Light Station, Cal., \$29,000.

NOTE.—Improvements to the combined tower and dwelling at this station are required to keep them in a serviceable condition. Fogs are of frequent occurrence at this point, and a first-class compressed-air signal, together with quarters for two additional keepers, are urgently required. Traffic into Monterey Harbor is steadily increasing and a number of large oil-carrying steamers now run regularly to this port, where oil is piped from the oil fields in the interior of the State. Detailed estimate:

| | |
|--------------------------------------|---------------|
| Fog-signal building..... | \$3,000 |
| Fog-signal apparatus..... | 7,000 |
| Dwellings for two keepers..... | 12,000 |
| Improvements to present station..... | 4,500 |
| Contingencies..... | 2,500 |
| Total..... | 29,000 |

No. 41. *Milwaukee Pierhead, Wis., Light Station.*—For improving Milwaukee Pierhead Light Station, Wis., \$25,000.

NOTE.—The keeper's quarters are on an isolated timber crib, on which the last important repairs were made in 1899. It is now in a very dangerous condition and needs rebuilding from the water line up by removing to approximately 2 feet below lake level and rebuilding in concrete. The improvement would then be a permanent one and the subsequent cost of maintenance would be low. Detailed estimate:

| | |
|---|---------|
| Concrete retaining walls..... | \$9,000 |
| Concrete floors, footings, and columns..... | 12,000 |
| Sundry repairs to dwelling..... | 2,000 |
| Contingencies..... | 2,000 |
| Total..... | 25,000 |

No. 42. *Spectacle Reef Light Station, Mich.*—For improving Spectacle Reef Light Station, Mich., \$17,500.

NOTE.—The wall surrounding the tower and supporting the fog-signal building and boathouse is disintegrating at the water line and should be repaired before further damage occurs. It is proposed to place a belt of steel flashing around the entire pier, commencing about 4 feet below the water line and extending about 3 feet above, fastening the same by heavy expansion bolts and back filling the voids with concrete after placing the plate. Detailed estimate:

| | |
|-------------------------|---------|
| Steelwork in place..... | \$7,080 |
| Concrete backing..... | 5,000 |
| Anchor bolts..... | 3,000 |
| Contingencies..... | 2,500 |
| Total..... | 17,500 |

No. 43. *Michigan Island Light Station, Wis.*—For establishing a light and fog-signal station on Michigan Island (Lake Superior), Wis., \$100,000.

NOTE.—The act approved May 27, 1908 (35 Stat., 332), appropriated \$2,000 to make a survey and estimate the cost and report upon the feasibility and need of establishing a light and fog signal upon Gull Island or the easterly end of Michigan Island, Apostle Group. As a result of this survey, the conclusion has been reached that the eastern end of Michigan Island is the better site. The act of June 17, 1910 (36 Stat., 536), authorized the construction of a light and fog-signal station at Michigan and Gull Islands at a cost not to exceed \$140,000, but no appropriation has been made therefor. Detailed estimate:

| | |
|------------------------------------|----------|
| Tower and fog-signal building..... | \$45,000 |
| Illuminating apparatus..... | 7,000 |
| Fog signal..... | 9,000 |
| Dwellings for three keepers..... | 18,000 |
| Outbuildings, boats, etc..... | 6,000 |
| Fences, walks, derricks, etc..... | 5,000 |
| Contingencies..... | 10,000 |
| Total..... | 100,000 |

No. 44. *Kauhola Point, Hawaii, Light Station.*—For improving the light station at Kauhola Point, Hawaii, \$15,000.

NOTE.—Owing to the importance of this station, located near the northern point of the Island of Hawaii, steps have been taken to change the present lens-lantern light to a converted flashing fourth-order lens. To support this lantern and lens and to complete the improvement of this station, a new tower is necessary. Detailed estimate:

| | |
|--------------------------------|----------|
| 75-foot cast-iron tower..... | \$10,000 |
| Erection at site complete..... | 3,600 |
| Contingencies..... | 1,400 |
| Total..... | 15,000 |

No. 45. *Goat Island, Cal., lighthouse depot.*—For repairs and improvements to Goat Island lighthouse depot, near San Francisco, Cal., \$43,000.

NOTE.—This depot occupies a small area gained by cutting down the steep bluff at the southeast point of Goat Island in San Francisco Bay and filling in along the shore line with the material thus secured. This area and that afforded by the present wharf is now inadequate to afford a proper disposition of the property required to be stored there. This is the only depot in the district. An additional area should be filled in with excavated material to afford room for new storehouses and additional room for storing buoys. The present storehouses are merely wooden sheds, old and poorly constructed. The present wharf should be extended to afford room for working two tenders alongside at the same time, and to permit landing and loading supplies without having to shift material already stored on the wharf. The quarters provided for the depot force are old and insanitary in arrangement and location. New quarters should be provided on higher ground and the site of the present quarters utilized for the needs of the depot proper. Detailed estimate:

| | |
|---------------------------------------|---------|
| Retaining wall and fill..... | \$5,000 |
| Storehouse, reinforced concrete..... | 18,000 |
| Wharf, additional, on iron piles..... | 12,000 |
| Dwelling..... | 8,000 |
| Total..... | 43,000 |

No. 46. *Santa Barbara, Cal., Light Station.*—For improving Santa Barbara Light Station, Cal., \$29,000.

NOTE.—The station is old and the tower is too small to accommodate the revolving lens now installed in it. The tower stands one-eighth of a mile back from the point of the shore line and the light is partly obscured by trees on other properties. A new tower is required to be built farther out on the point. Coasting vessels bound north keep close inshore to avoid the prevailing northwesterly wind and sea, and a fog signal should be established here with quarters for two additional keepers. An improvement has been made in changing the light from fixed to occulting and an increase of intensity. The fog signal, as well as other improvements, and a new light tower, are necessary to render the aids efficient. Detailed estimate:

| | |
|--|---------|
| Tower, lantern, and fog-signal building..... | \$8,000 |
| Fog-signal apparatus..... | 7,000 |
| Additional quarters..... | 7,000 |
| Improvements to present station..... | 4,500 |
| Contingencies..... | 2,500 |
| Total..... | 29,000 |

No. 47. *Cape Spencer, Alaska, Light Station.*—For establishing a light and fog-signal station at or near Cape Spencer, Alaska, \$100,000.

NOTE.—Cape Spencer is at the entrance to Cross Sound and Icy Strait, through which pass all vessels running from Puget Sound ports to Prince William Sound, Seward, Cook Inlet, and Kodiak, excepting only occasional freighters proceeding by the outside route. With the construction of the proposed Alaskan railroad the traffic by way of Cape Spencer will be materially increased. A small unwatched light is now maintained on the cape, but it is believed that a large watched light and fog signal should be provided, especially for vessels returning from the westward, to be used as a landfall, as it is important that they be given all possible assistance, especially in thick weather. Maritime interests have urged the establishment of this aid. Detailed estimate:

| | |
|-----------------------------|---------|
| Foundation..... | \$4,000 |
| Buildings and tower..... | 72,000 |
| Illuminating apparatus..... | 9,000 |
| Fog-signal apparatus..... | 6,000 |
| Contingencies..... | 9,000 |
| Total..... | 100,000 |

No. 48. *Hilo, Hawaii, aids to navigation.*—For establishing and improving aids to navigation at Hilo, Hawaii, \$19,000.

NOTE.—Hilo is the second port of importance in the Hawaiian Islands, and it is probable that the opening of the Panama Canal will greatly increase its shipping. The present lighting is inadequate. It is proposed to establish, (1) an acetylene light in place of the present lens lantern at Ala Point, the entrance to Hilo Bay; (2) a combination gas and whistling buoy in place of the Blonde Reef Whistling Buoy, with lanterns and attachments; (3) an acetylene light on the end of the Hilo Breakwater when completed. Detailed estimate:

| | |
|---|----------|
| Ala Point light..... | \$11,000 |
| Combination gas and whistling buoy..... | 5,000 |
| Hilo Breakwater light..... | 3,000 |
| Total..... | 19,000 |

No. 49. *Portage Lake, Mich., aids to navigation.*—For establishing a light and fog-signal station upon a new site and improving aids to navigation at Portage Lake Ship Canals, Mich., \$100,000.

NOTE.—The War Department intends to remove the breakwater, and it is therefore necessary to rebuild the light and fog signal on a new site. The new light and fog signal should be established on a pier at the outer entrance, where it would be of the best service to vessels making the harbor. The construction of the station proposed will require considerable time to complete, and this project should have consideration for that reason. Detailed estimate:

| | |
|--|----------|
| Dredging, piling, and cribwork..... | \$15,000 |
| Stone filling and riprap work..... | 10,000 |
| Concrete base with metal flashing..... | 36,000 |
| Superstructure..... | 30,000 |
| Fog signal and lighting equipment..... | 9,000 |
| Contingencies..... | 6,000 |
| Total..... | 100,000 |

No. 50. *Ram Island, Me., light.*—For establishing a light on Ram Island, Lower Kennebec River, Me., \$3,100.

NOTE.—The need of this light has several times been expressed by petition. Ram Island is about 5½ miles below Bath, Me.; it is a low island in the middle of the river, with a string of half-tide ledges making off on the easterly side. There is a passage on either side, and at some stages of the tide a 5-knot current exists, from which several accidents have occurred. About 300,000 tons of freight and 175,000 passengers are transported past this island annually, not including the many pleasure craft and small boats which frequent the river. It is proposed to establish an acetylene light on or near the easterly side of Ram Island. Detailed estimate:

| | |
|--------------------------------------|---------|
| Light structure, including site..... | \$1,800 |
| Illuminating apparatus..... | 1,300 |
| Contingencies..... | 200 |
| Total..... | 3,100 |

No. 51. *Cape Kumukahi, Hawaii, Light Station.*—For establishing a light at or near Cape Kumukahi, Hawaii, \$24,000.

NOTE.—Cape Kumukahi is the easternmost cape of Hawaii. There is at present no landfall light for vessels bound to Hilo from the Panama Canal or from the southeast. It is a difficult point to round when sailing from Hilo to the south point or vice versa. A light on this point would be a great improvement to the lighting of the islands. The country in this vicinity is barren, undulating lava rock. An acetylene light is recommended with a focal plane height of about 150 feet, which would be visible about 20 miles. Landing from seaward at the cape is impossible at most times, and the only practical method of supplying this station would be by railroad from Hilo to Kapoho and then by wagon road 3 miles to the cape, 1½ miles of which would have to be constructed over the rock. Detailed estimate:

| | |
|---|---------------|
| Road..... | \$6,500 |
| Tower, including site and right of way..... | 11,500 |
| Illuminating apparatus..... | 4,000 |
| Contingencies..... | 2,000 |
| Total..... | 24,000 |

No. 52. *Washington and Oregon, aids to navigation.*—For the establishment of aids to navigation and improvement of existing aids in Washington and Oregon, seventeenth lighthouse district, \$35,000.

NOTE.—There has been an increasing demand from shipping interests for additional lighted aids in these waters. It is also desirable to improve a number of existing aids which are now obsolete and unsatisfactory. Gas buoys are desired at Coos Bay, Oreg., Grays Harbor, Willapa Bay, Georgia Straits, and Puget Sound, Wash., and improved lights at a number of places in the lower Columbia River, Wash. and Oreg., and on Clark and Cypress Islands, Wash. Detailed estimate:

| | |
|--|---------------|
| 7 gas-lighted buoys, at \$3,000..... | \$21,000 |
| 14 unwatched gas lights, at \$1,000..... | 14,000 |
| Total..... | 35,000 |

No. 53. *Henderson Point, Me., Light Station.*—For establishing a light and fog signal at or near Henderson Point, Piscataqua River, Portsmouth Harbor, Me., \$3,800.

NOTE.—The need of this aid has several times been expressed by petition. It is often very difficult to locate Henderson Point at night and in thick weather; the channel is narrow and there is a strong tide at this point, where the course changes. The commercial statistics for Portsmouth Harbor indicate about 5,600 vessels arriving and departing annually, transporting about 610,000 tons of freight. It is proposed to establish an acetylene light with fog bell. Detailed estimate:

| | |
|--|--------------|
| Structures, including sites..... | \$1,800 |
| Illuminating and fog-signal apparatus..... | 2,000 |
| Total..... | 3,800 |

No. 54. *Port Real, P. R., Light Station.*—For establishing a light station at or near Port Real, P. R., \$34,000.

NOTE.—The lighthouse at Port Ferro, on the south coast of Vieques or Crab Island, is one of the primary seacoast lights of the Porto Rican system. The light tower and the keepers' dwelling attached to it are built on top of a rocky promontory undermined for some time by the sea waves, and the whole structure, already dangerously cracked, is in danger of collapsing. It is urgent to rebuild a lighthouse at or near this point, as this is an important aid to the navigation from St. Thomas to Cuba and other West Indian Islands and the Caribbean Sea. A light in this vicinity is necessary for navigation, and it is proposed to dismantle the present Port Ferro Light Station and to erect a new light station at Port Real, about 3 miles westward, where the aid will be more useful and on better ground than on its present location at Port Ferro, as Port Real is the most important and the best anchorage around Vieques Island. The present apparatus at Port Ferro is to be used for this new station. Detailed estimate:

| | |
|--|---------------|
| Tower and dwellings for two keepers..... | \$25,000 |
| Outbuilding and piping..... | 1,000 |
| Purchase of site..... | 2,000 |
| Roads and grounds..... | 2,000 |
| Contingencies..... | 4,000 |
| Total..... | 34,000 |

No. 55. *Nine Mile Point, Mich., Light Station.*—For establishing a light and fog-signal station at or near Nine Mile Point, Mich., \$50,000.

NOTE.—When Forty Mile Point Light Station was established it was placed on the site designated Forty Mile Point on the county-survey charts. Sailing masters expected the station to be placed at Nine Mile Point, near the entrance to the Straits of Mackinac, but which was not so called officially then. While Nine Mile Point is within the visibility of Spectacle Reef and Poe Reef Light Vessel lights, a fog signal would be of especially great service in thick and foggy weather and during seasons when forest fires prevail. Not less than nine strandings occurred here between 1903 and 1909. In the event of establishing this station, Forty Mile Point could be made a minor light. Detailed estimate:

| | |
|---|---------------|
| Tower..... | \$15,000 |
| Illuminating apparatus..... | 2,000 |
| Fog-signal building and apparatus..... | 9,000 |
| Dwellings for three keepers..... | 15,000 |
| Outbuildings, boathouse, fences, etc..... | 6,000 |
| Contingencies..... | 3,000 |
| Total..... | 50,000 |

No. 56. *Anacapa Island, Cal., Light Station.*—For establishing a light and fog signal at or near Anacapa Island, Cal., \$103,000.

NOTE.—Practically all coastwise vessels and a large number of those bound for Panama use the Santa Barbara Channel, and this traffic will be greatly increased with the opening of the Panama Canal. The desirable course leads close to the eastern end of Anacapa Island, which is now marked by a small beacon light, not sufficiently powerful to be of service in hazy weather. The American Shipmaster's Association has presented a petition for a light and fog signal, indorsed by the San Francisco and Los Angeles chambers of commerce and important shipping interests on the Pacific coast. It is therefore recommended that a light of high candle power and a first-class fog signal be established at this point as soon as practicable.

| | |
|--|---------|
| Light tower..... | \$9,000 |
| Illuminating apparatus..... | 8,500 |
| Fog-signal building and apparatus..... | 14,000 |
| Two sets double quarters for four keepers..... | 24,000 |
| Oil house, outbuildings, etc..... | 6,000 |
| Wharf, launch landing, and derrick..... | 11,000 |
| Roads, grading, and fencing..... | 7,000 |
| Water supply and sewerage system..... | 14,000 |
| Contingencies..... | 9,500 |

Total..... 103,000

Total, group No. 3, \$1,831,900 (not included in total of estimates).

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DESCRIPTIONS OF NEW WORKS COMPLETED.

The following are brief technical descriptions of important lighthouse works completed since the end of the fiscal year 1913:

OIL HOUSES FOR LIGHT STATIONS.

Purpose.—Isolated fireproof structures for the storage of kerosene and other inflammable supplies were erected at 38 light stations, in order to lessen the hazard of fire at such stations. These oil houses were constructed under allotments made from the balances existing under appropriations of \$10,000 each by the acts of May 27, 1908, March 4, 1909, and June 25, 1910. Details regarding each are shown in the following table:

| District. | Station. | Site and structure. | Completed. | Cost. |
|-----------|---------------------------------------|--|---------------|-------|
| 3d..... | Execution Rocks, N. Y..... | Enlarging former brick house and providing slate roof. | July 31, 1913 | 1391 |
| | Old Orchard Shoal, N. Y.... | Steel tanks on cradles on deck of station. | May 8, 1914 | 327 |
| | West Bank, N. Y..... | do. | May 20, 1914 | 407 |
| 4th..... | Delaware Breakwater Range Front, Del. | Reinforced concrete, with iron doors and ventilators. | July 3, 1913 | 531 |
| 5th..... | Piney Point, Md..... | do. | July 9, 1913 | 299 |
| | Blakistone Island, Md..... | do. | July 19, 1913 | 265 |
| | Fort Washington, Md..... | do. | Aug. 4, 1913 | 252 |
| | Turkey Point, Md..... | do. | Sept. 6, 1913 | 247 |
| | Ocracoke, N. C..... | do. | Mar. 4, 1914 | 361 |
| 7th..... | Fowey Rocks, Fla..... | Steel tanks suspended in framework of tower. | Feb. 13, 1914 | 360 |
| | Alligator Reef, Fla..... | do. | do. | 360 |
| | Sombrero Key, Fla..... | do. | do. | 360 |
| | American Shoal, Fla..... | do. | do. | 362 |
| | Rebecca Shoal, Fla..... | do. | do. | 194 |
| 9th..... | Arecibo, P. R..... | Reinforced concrete throughout. | Jan. 6, 1914 | 431 |
| | Point Borinquen, P. R..... | do. | do. | 421 |
| | Mona Island, P. R..... | do. | do. | 421 |
| | Cape Rojo, P. R..... | do. | do. | 421 |
| | Guanica, P. R..... | do. | do. | 371 |
| | Cardona Island, P. R..... | do. | do. | 371 |
| | Muertos Island, P. R..... | do. | do. | 421 |
| | Jobos Harbor, P. R..... | do. | do. | 371 |
| | Point Figuras, P. R..... | do. | do. | 371 |
| | Point Tuna, P. R..... | do. | do. | 421 |
| | Culebrita Island, P. R..... | do. | do. | 421 |
| | Point Mulass, P. R..... | do. | do. | 371 |
| | Cabras Island, P. R..... | do. | do. | 371 |
| | Cape San Juan..... | do. | do. | 421 |
| 12th..... | Portage Lake, Mich..... | Concrete floor, brick walls, asbestos shingle roof, steel doors, shelves, etc. | July 7, 1913 | 514 |
| | Pentwater, Mich..... | do. | July 12, 1913 | 500 |
| 17th..... | Alki Point, Wash..... | Concrete floor, asbestos shingle walls and roof, copper ventilators, etc. | Aug. 12, 1913 | 458 |
| | Point Wilson, Wash..... | Concrete floor, corrugated galvanized iron walls, roof, ventilators, etc. | Aug. 23, 1913 | 377 |
| | Robinson Point, Wash..... | do. | Oct. 29, 1913 | 377 |
| | Turn Point, Wash..... | do. | Dec. 5, 1913 | 377 |
| 18th..... | Point Hueneme, Cal..... | Terra-cotta blocks, plastered both sides, reinforced concrete roof. | Nov. 7, 1913 | 528 |
| | Farallon, Cal..... | do. | Aug. 9, 1913 | 455 |
| | Los Angeles Harbor, Cal..... | Reinforced concrete throughout, anchored to breakwater. | Dec. 26, 1913 | 550 |
| 19th..... | Kauhola Point, Hawaii..... | Reinforced concrete throughout, galvanized iron door. | Nov. 15, 1913 | 408 |

STORAGE HOUSE FOR OIL, WOODS HOLE, MASS.

Purpose.—A fireproof oil house for the storage of all kinds of oil and carbide was constructed at Woods Hole lighthouse depot to replace a frame building.

Site.—The site is near the south end of the reservation on the bulkhead of the wharf.

Structure.—The building is 20 feet by 40 feet, has 8-inch brick walls with buttresses, and corrugated asbestos roof supported on six steel trusses and steel purlines, with ventilators built into each gable. Has two doors covered with galvanized sheet iron. Each door has one light wire glass in same.

Cost.—The building was constructed under an allotment of \$1,500, from the sum of \$3,000 appropriated by act of March 27, 1908, and was built by hired labor, at a cost of \$1,500. Work was commenced July 1, 1913, and completed November 29, 1913.

POWER HOUSE, GENERAL LIGHTHOUSE DEPOT.

Purpose.—To furnish heat, light, and power for various shops and other buildings at the third district depot, and to replace four old inefficient steam plants formerly in use.

Site.—Centrally located in depot grounds.

Structure.—A concrete building 112 feet long, 50 feet wide, with partition in center, making boiler room 46 feet by 45 feet 9 inches and engine room 46 feet by 61 feet 3 inches. Plant is equipped with three 250-horsepower Continental boilers, two 250-kilowatt, 220-volt turbine-driven generators for power service, two 75-kilowatt 110-volt turbine generators for lighting service, and two 400-foot steam-driven air compressors, together with necessary auxiliaries for condensing plant. The new power house was built over one of the old ones, and when completed the old station was removed; work of installing new and removing old boilers and machinery was so conducted that power for the operation of shops, etc., was obtainable at all times, and when the new plant was sufficiently completed to permit, all old steam plants were discontinued and all shops, etc., were operated by electricity.

Cost.—This power house was built under the act of March 4, 1911, appropriating \$30,000 for power house and foundry. The total cost of station to date is \$24,290.29. The building was built by contract. The installation of boilers, machinery, foundations, etc., was done by hired labor, permanent force, and purchase of material. Work was commenced in October, 1911, and plant placed in operation August 1, 1913, and at present time is completed with exception of small amount of work on the finish of floor.

FOUNDRY, GENERAL LIGHTHOUSE DEPOT.

Purpose.—The foundry was built to permit making brass and iron castings for use in connection with manufacturing at this depot, the method of having same done by contract having been found unsatisfactory on account of the expense and delay occasioned in obtaining castings.

Site.—The building is located on south side of depot grounds alongside of the machine shop.

Structure.—Consists of a brick building 64 feet 2 inches long by 40 feet 10 inches wide, with steel roof trusses and slate-covered roof. The floor is of concrete, with casting pit in center. The equipment will consist of three oil-burning furnaces, together with core oven and other necessary apparatus.

Cost.—The foundry was constructed under the act of March 4, 1911, appropriating \$30,000 for power house and foundry. The building was built by contract. Work was commenced July, 1912, and completed October, 1912. The floors, etc., were installed by depot force and hired labor, and machinery is being installed by depot force. The installation of machinery will be completed and foundry placed in operation about December, 1914. The total cost to date is \$5,165.

REPAIRS, SOUTH WHARF, GENERAL LIGHTHOUSE DEPOT.

Purpose.—The repairs to this wharf were made necessary owing to the decay of the old wooden deck.

Site.—The part of south wharf repaired is 163 feet 6 inches long by 45 feet wide and extends in a northerly direction along the inner side south sea wall forming the basin at this depot.

Structure.—The original structure consisted of cast-iron piles driven in bents 12 feet centers, with double 12-inch I-beam girders across the top, over which were placed 6 by 12-inch wooden stringers, spaced 2 feet 6-inch centers, for supporting wooden deck planking. The old wood deck and stringers were removed, new 10-inch steel I-beam stringers spaced 12-foot centers were installed, and concrete deck 10 inches thick, crowned 3 inches in center, reinforced with $\frac{3}{4}$ -inch rods, spaced 8-inch centers, installed. New fender piles and backing logs to cushion the concrete dock were installed.

Cost.—The repairs to the dock were made under the act of March 4, 1911, appropriating \$40,000. (See report for 1913, p. 92, for other work done under this appropriation.) The work was done under contract, costing \$10,191. Work was commenced April 8, 1914, and will be completed about August 5, 1914.

LIGHTHOUSE TENDER WOODBINE.

Purpose.—The tender *Woodbine* was originally intended for the engineer of the third lighthouse district for use on Lake Champlain and subsequent to the reorganization was modified as a tender for general service.

Structure.—This tender is 95 feet and 1 inch over all, with a beam of 16 feet. The gross tonnage is 70.54 tons. The hull is built of wood. A derrick mast and boom are fitted just forward of the deck house.

Machinery.—The propelling machinery consists of one three-cylinder internal-combustion engine of 125 horsepower, using kerosene oil, driving a propeller 4 feet 6 inches diameter by 5 feet 6 inches pitch. The machinery is located immediately forward of the midship section. The tender is fitted throughout with modern appliances, including hoisting engine, located immediately forward of the engine space below the deck, sanitary plumbing and fixtures, and drainage system, but has no electric lighting plant.

Quarters.—The complement of the tender is two officers and four men. The officers' quarters are on the main deck. Quarters for the men are located under the buoy deck, just forward; also cargo hold, storerooms, and lockers. The galley is located immediately aft of the engine space. Aft of the galley is a stateroom, bath, and saloon with folding beds for the inspector or other official passengers.

Cost.—The tender was constructed under the act of March 4, 1907, appropriating \$25,000. This tender was placed under contract at West New Brighton, N. Y. The failure of the contractors delayed the completion of the vessel and on October 22, 1912, it was taken over by the Government under a supplemental contract and completed by the Lighthouse Service. An internal-combustion engine was substituted for the steam-propelling plant and such structural modifications made, including a 3-ton derrick, so as to make the vessel an efficient tender for general service. Construction was completed March 9, 1914, at Baltimore, Md., and the tender assigned to duty in the fifth lighthouse district.

AIDS IN NORFOLK HARBOR, VA.

Purpose.—To mark the dredged channel leading into Norfolk Harbor and for the better protection of shipping entering the same, one light vessel and six additional gas buoys were established.

Site.—The light vessel was moored to mark the turn in the channel north of Craney Island Light Station, and the buoys are located three on the starboard and three on the port side of the channel.

Structure.—The light vessel was the old Coast Survey vessel *Drift*, which was turned over to the Lighthouse Service, renumbered No. 97, and refitted to meet the needs of the service.

The buoys established are of the oil-gas type.

Illuminating apparatus.—Bush Bluff light vessel No. 97 is provided with a 500-millimeter lens lantern, housing a revolving parabolic reflector, using an incandescent electric light as the illuminant: Color, flashing white, flashing every 10 seconds; focal plane, 50 feet above water; candlepower, 80,000; miles visible, 12½. The current used is provided from storage batteries, which operate the motor for revolving the reflector and supplying current for the light.

Each gas buoy is provided with a 200-millimeter lens lantern, burning oil gas and showing the following:

| No. | Color. | Light. | Eclipse. | Focal plane. | Candle-power. | Miles seen. |
|-----|------------------------|-----------------|-----------------|--------------|---------------|-------------|
| | | <i>Seconds.</i> | <i>Seconds.</i> | <i>Feet.</i> | | |
| 2A | Oscillating white..... | 5 | 5 | 13 | 120 | 8½ |
| 8 | Oscillating red..... | 13 | 8 | 11 | 35 | 5 |
| 3B | Oscillating white..... | 5 | 5 | 13 | 120 | 8½ |
| 12A | Oscillating red..... | 5 | 5 | 13 | 35 | 5 |
| 16 | do..... | 10 | 10 | 13 | 35 | 5 |
| 7A | Oscillating white..... | 5 | 5 | 13 | 120 | 8½ |

Cost.—These aids were established under the act of March 4, 1911, appropriating \$35,000, and have cost \$16,020.76. The work was commenced in 1911 and completed in the fall of 1913.

SAND ISLAND LIGHT STATION, ALA., PROTECTION OF SITE.

Purpose.—On account of the sea having flattened out and scattered the rock protection which was placed around the tower during former years, it was necessary to place additional rock protection to prevent the foundation from undermining and to protect the tower from the heavy seas which prevail in the locality.

Site.—The station is surrounded by an artificial rock island at the entrance to Mobile Bay, about 35 miles from the city of Mobile, Ala. It was originally built on land, which has gradually washed away, leaving it wholly in the water, and has only been maintained in position by placing rock around the tower.

Structure.—The tower is of brick, resting on a foundation of wooden piles and grillage.

Riprap protection.—One thousand and eighty tons of rock, ranging in weight from 25 to 300 pounds each piece, and 607 tons, of 2,000 pounds, ranging in weight from 1 to 2 tons each piece, were placed to good advantage around the tower under this special appropriation.

Cost.—This improvement was made under the act of March 4, 1911, appropriating \$15,000. The total cost was \$14,270.17, and the work was done by contract, with bond, commencing December, 1912, and completed December, 1913.

BUFFALO BREAKWATER NORTH END LIGHT STATION, N. Y.

Purpose.—To replace the old and decayed structures with a modern building and apparatus. The structure is completed, the fog signal in operation, and the light in course of installation; the station was originally established in 1872 to mark the north entrance to Buffalo Harbor, N. Y.

Site.—The station is located inside of the north end of the Buffalo Breakwater. The bottom is rock covered by hard sand. The old superstructure was removed to a point 4 feet below mean lake level and reconstruction made from that plane.

Structure.—The base of the structure is of reinforced concrete, built on concrete blocks resting on the underwater crib foundation. The building is rectangular, constructed of vitrified cream-colored brick, with trim of Westerly granite. The roof is framed in steel with wood sheathing and covered with tile. Valleys, gutters, leaders, and flashings are of tin-coated copper.

The interior partitions are brick walls, except the pantry, which is expanded metal. The interior walls of entrance corridor, lavatories, engine room, and tower are faced with cream-colored enameled brick. The corridor and bath room floor are ceramic tile finish; the engine room floor of terra cotta promenade tile; the floors of the office, living, and sleeping rooms are maple; the stairs and landing, rising through the tower, are framed in steel with cast-iron treads and landing plates.

Illuminating apparatus.—This apparatus consists of a standard third-order helical bar lantern, containing a third-order 4-panel flashing lens revolving on a combination mercury pot and ball-bearing support, with a clock in the pedestal below, showing a white flash every five seconds, estimated at 180,000 candlepower. The light is furnished by a 55-millimeter type B single-tank incandescent oil vapor lamp with a focal plane 65 feet above mean lake level and with a geographic range of visibility of 15½ miles.

Fog signal.—The fog-signal apparatus consists of a type F diaphone in duplicate, blown by compressed air; this installation is the first one in the United States Lighthouse Service.

The air is compressed by duplicate 22-horsepower direct-connected oil-driven air compressors with opposed cylinders on unit-bed castings. The engines are of the horizontal, four-cycle type, and are immediately self-starting on gasoline. The stored air reserve can be used both for starting the engines and for actuating the signal should for any reason a delay occur in starting the compressors. A special timing device operated by a small rotary motor run by compressed air governs the characteristic. An auxiliary pump unit furnishes water by suction from the lake or from the cellar cistern to the attic tank.

Quarters.—There are quarters for three keepers, without families. The cellar in the concrete base contains a cistern, coal bin, paint room, and storage space for oil

tanks, air receivers, etc. The first floor contains an entrance corridor with vestibule, a lavatory, an office, a storeroom, and the engine room, from which latter the stairway rises through the tower. The second floor contains a living room with pantry, three bedrooms, and a lavatory. The attic contains a water tank, supplying the engine and compressor circuits and the sanitary circulation, also storage space for air receivers, fog-signal apparatus, etc.

Cost.—The station was rebuilt under the act of March 4, 1911, appropriating \$60,000. Amount expended to June 30, 1914, is \$53,356.78.

The construction and the furnishing of the fog-signal plant were by contracts; the installation of the apparatus was by hired labor. The station was completed and the fog signal installed by July 21, 1914, and the light will be installed as soon as necessary apparatus therefor is received.

ST. MARYS RIVER, MICH.

Purpose.—Many of the structures supporting the lights in the St. Marys River had been damaged by the ice action, requiring large amounts of riprap protection, and some complete reconstruction in concrete and steel. Moreover, all of the lights were oil burning and very difficult of attendance in fall and spring. The original project included the repair or reconstruction of 43 light structures and the change of illuminant of each from oil to oil gas. Two additional lights were added, making 45, all of which were completed on June 30, 1914.

Sites.—The above structures are located along the St. Marys River, Mich., all but six of them being on submarine sites. In some cases the bottom is very soft clay, especially in Mud Lake and Hay Lake along the West Neebish Channel, where the depth of water is about 25 feet. The depth of water in other places varies from 3 to 25 feet.

Structures.—The structures for the most part consist of timber cribs sunk on a bed of riprap stone, ballasted with stone filling, and capped by either a smaller crib or a concrete pier. In a number of cases riprap stone has been placed around the piers to protect them from being carried away by the ice. The remainder of the substructures are of wood piling, supporting a timber platform. The superstructures in most cases consist of steel posts with small lamp house beside it. For the ranges, steel towers are generally used. Two pile structures were cut away, the piles capped by a concrete pier, and ripped. Four timber cribs were torn down to below water line and rebuilt in concrete. Seven piers were thoroughly ripped with large stone. Eight frame superstructures were replaced by steel. One complete structure of concrete with steel superstructure was constructed new. Minor repairs were made to all structures.

Illuminating apparatus.—The illuminating apparatus for 40 of the lights affected is a standard United States lens lantern converted to adapt it for oil gas apparatus. Two of the lights are locomotive headlight reflectors converted to adapt for oil-gas apparatus, and one is a fifth-order lens with oil-gas apparatus mounted inside it. All are provided with mantle burners consuming 1.5 feet per hour in the case of the red lights and 1 foot per hour in the case of all white lights. All range lights and those at important turns are fixed, while others are occulting.

Fog signals.—None.

Quarters.—None.

Cost.—The above improvements, reconstruction, and repairs were accomplished under the act of August 26, 1912, appropriating \$60,000 for the improvement of aids to navigation, St. Marys River, Mich. The amount expended to June 30, 1914, is \$56,279.68.

AIDS TO NAVIGATION, ALASKA.

Purpose.—During the year nine additional acetylene and one float light (oil) were established at certain points in Alaska, to meet the demands of an increasing commerce and to continue the work of properly lighting and marking these waters.

Dates of establishment, sites, structures, and illuminating apparatus are given in tables following.

| No. | Name of light. | Site of locality. | Structure. | Illuminating apparatus. |
|-----|----------------------|---------------------------------|---|---|
| 1 | Woody Island..... | Kodiak Harbor..... | A small wooden house supporting a lens lantern; focal plane 10 feet above ground. | 200-mm. lens and $\frac{1}{2}$ -foot burner showing flashing white light |
| 2 | Pilot Rock..... | Resurrection Bay..... | do..... | Do. |
| 3 | Caines Head..... | do..... | do..... | Do. |
| 4 | Point Elington.... | Prince William Sound..... | do..... | 375-mm. lens and $\frac{1}{2}$ -foot burner showing flashing white light. |
| 5 | Smith Island..... | do..... | do..... | 375-mm. lens and $\frac{1}{2}$ -foot burner showing double white flash. |
| 6 | Point Ellis..... | do..... | do..... | 200-mm. lens and $\frac{1}{2}$ -foot burner showing flashing white light. |
| 7 | Cape Spencer..... | Cross Sound..... | do..... | 375-mm. lens and $\frac{1}{2}$ -foot burner showing flashing white light. |
| 8 | Burnett Inlet Float. | Burnett Inlet, Clarence Strait. | Wooden scow with horizontally slatted pyramidal superstructure. | Post lantern burning oil. |
| 9 | Cape St. Elias..... | Gulf of Alaska..... | A small wooden house supporting a lens lantern; focal plane 10 feet above ground. | 375-mm. lens and 1-foot burner showing flashing white light. |
| 10 | Windy Bay..... | Prince William Sound..... | do..... | 200-mm. lens and $\frac{1}{2}$ -foot burner showing flashing white light. |

| No. | Name of light. | Characteristic. | Intensity. | Focal plane above mean high water. | Miles seen. | Cost. | Date of establishment. |
|-----|----------------------|--|----------------------|------------------------------------|-------------|----------|------------------------|
| | | | <i>Candle-power.</i> | <i>Feet.</i> | | | |
| 1 | Woody Island..... | Flash, 0.3 sec.; eclipse, 2.7 sec. | 130 | 50 | 9 | \$982.68 | Aug. 6, 1913 |
| 2 | Pilot Rock..... | Flash, 0.6 sec.; eclipse, 5.4 sec. | 130 | 100 | 9 | 1,039.84 | Aug. 22, 1913 |
| 3 | Caines Head..... | Flash, 0.3 sec.; eclipse, 2.7 sec. | 130 | 30 | 9 | 1,096.28 | Aug. 30, 1913 |
| 4 | Point Elington.... | Flash, 0.5 sec.; eclipse, 4.5 sec. | 310 | 65 | 12 | 1,222.55 | Sept. 2, 1913 |
| 5 | Smith Island..... | Flash, 0.3 sec.; eclipse, 0.9 sec.; flash, 0.3 sec.; eclipse, 4.5 sec. | 310 | 40 | 12 | 1,643.03 | Sept. 11, 1913 |
| 6 | Point Ellis..... | Flash, 0.3 sec.; eclipse, 2.7 sec. | 130 | 28 | 9 | 1,252.30 | Sept. 18, 1913 |
| 7 | Cape Spencer..... | Flash, 0.5 sec.; eclipse, 4.5 sec. | 310 | 90 | 12 | 2,614.46 | Oct. 6, 1913 |
| 8 | Burnett Inlet Float. | Fixed white..... | 40 | 8 | ..... | \$275.00 | May 15, 1914 |
| 9 | Cape St. Elias..... | Flash, 1 sec.; eclipse, 9 sec. | 530 | 40 | 12 | 2,664.18 | June 13, 1914 |
| 10 | Windy Bay..... | Flash, 1 sec.; eclipse, 9 sec. | 130 | 23 | 9 | 1,125.57 | June 24, 1914 |

* Estimated, exact figures not yet available.

Fog signals.—There are none.

Quarters.—There are no quarters for these beacons, the lights being of the unwatched type, all except one using compressed acetylene in acetone, in which cases the tanks containing the gas are landed at the stations by boat from the tender. The oil float light at Burnett Inlet is attended by local persons.

Cost.—These aids were established under the act of March 4, 1911, appropriating \$60,000. Their total cost was \$13,945.89. The work was carried out by the purchase of materials and hired labor.

KEEPER'S DWELLING, KAUHOLA POINT LIGHT STATION, HAWAII.

Purpose.—The keeper formerly lived in his own house about $1\frac{1}{2}$ miles distant from the lighthouse and was often compelled to remain at the station at night in a shed at the base of the tower. This condition made it difficult to obtain satisfactory service, and therefore proper quarters were erected.

Site.—The dwelling is erected upon the lighthouse reservation and is located approximately 475 feet south from the tower.

Structure.—The dwelling is a one-story frame structure, with plastered interior and asbestos shingled roof and is supported upon a concrete pier foundation. It is approximately 34 by 35 feet in plan, and consists of a living-dining room, kitchen, pantry, two bedrooms, a bath, storeroom, and two closets, and is provided with a veranda off the living room, and complete plumbing.

Cost.—The building was constructed from an allotment of funds appropriated by the act of May 27, 1908, for light keepers' dwellings. The work was carried out by the purchase of materials and use of hired labor and was completed December 1, 1913, at a total cost of \$2,833.43.

REPORT
OF THE
SUPERINTENDENT, U. S. COAST AND GEODETIC SURVEY

569

REPORT

OF THE

SUPERINTENDENT, U. S. COAST AND GEODETIC SURVEY.

DEPARTMENT OF COMMERCE,
COAST AND GEODETIC SURVEY,
Washington, October 3, 1914.

SIR: There is respectfully submitted herewith the annual report of progress in the Coast and Geodetic Survey for the fiscal year ended June 30, 1914. It is accompanied by maps* illustrating the general advance in the field work of the Survey up to that date.

For many years it was recognized by my predecessors as well as by myself that the buildings in which the Survey is housed are unsuited to the most economical performance of the duties with which it is charged. Its priceless records are endangered by the inflammable construction of the buildings, whose design prevents the proper coordination of the duties and interferes with proper supervision. The obvious need of suitable housing has not failed to receive the consideration of the Department and this Bureau, but since the creation of the Department of Commerce the avowed intention of Congress to provide a permanent building for it and some of its detached bureaus has compelled the Bureau to await the final action of Congress. Closely connected with this subject is the matter of installing a suitable and economical heating, power, and lighting plant. The modernization of the instrument and chart-printing shops to meet the increasing demands on the service has received your personal attention.

An estimate was submitted to Congress calling for three new vessels for the Alaska service to take the place of three antiquated ships and for three smaller vessels to be used in wire-drag work, but the appropriation for their construction was not granted. The urgent need of increased appropriations for hastening the surveys of Alaska in aid of commerce and of the development of that vast territory is apparent and in keeping with the policy which the Government has adopted by authorizing the construction of railways and roads. On both coasts the changing conditions in the size of ships has rendered it necessary to supplement the ordinary methods of hydrographic surveying by dragging submarine areas with the wire drag, the only known method of insuring the safety of ships; and plans have been submitted for a more extensive use of the drag in order to examine areas which are known to require it, within a reasonable period of time.

The time has also arrived to hasten the progress of the triangulation of the interior of our country. This is evidenced by the de-

* Maps are reproduced in the pamphlet edition of this report of the Superintendent of the Coast and Geodetic Survey, but are omitted from this volume.

mands made upon this Bureau by the various governmental organizations that need data for the extension and coordination of the surveys which they are making by order of Congress in aid of the economic development of this country. If sufficient means are not provided for this Bureau, the inevitable result will be expenditures at increased cost to the Government among the bureaus of the several departments needing the data.

GENERAL STATEMENT OF PROGRESS.

HYDROGRAPHIC WORK.

Wire-drag examinations were made on the coast of Maine, in vicinity of Matinicus Island in the outer approaches to Penobscot Bay; in Buzzards Bay, Mass., in vicinity of the entrance to the Cape Cod Ship Canal; in Duck Island Harbor of Refuge, Conn., between Menunketesuck Point and Hammonasset Point; and in the approaches to Key West, Fla.

The steamer *Hydrographer* was employed on coast-pilot examinations on the coasts of Connecticut, New York, and New Jersey, and in hydrographic surveys on the coast of North Carolina.

The steamer *Endeavor* was employed on the hydrography of the coasts of Rhode Island and of North and South Carolina.

The steamer *Bache* made hydrographic surveys at the entrance to Chesapeake Bay and of Sabine Bank, Gulf of Mexico, and was engaged in oceanographic examinations between the Capes of Virginia, Bermuda, and Habana, Cuba.

The schooner *Matchless* made hydrographic surveys in the East Branch of Elizabeth River, Va., and in the vicinity of Cape Charles, Va.

One party was engaged in a resurvey of Newark Bay and Passaic River, N. J., and another in revising the coast-pilot directions for the Potomac River.

With the cooperation of the Bureau of Lighthouses a series of current observations was made on light vessels along the Atlantic coast.

Several parties were engaged in chart revision on the Atlantic coast, and an officer with headquarters at New York has acted as inspector for the section of the coast between Narragansett Bay and Delaware Bay.

On the Pacific coast the steamer *Gedney* was employed during the winter on a revision of the survey of Bellingham Bay, Wash., and a party was employed in a resurvey of Suisun Bay. A revision was also made of the survey of the water front at Seattle, Wash.

An officer stationed at Seattle was engaged in inspection duty on the coasts of Washington and Oregon and another with headquarters at San Francisco performed similar duty for the coast of California.

The steamer *Explorer* was employed in the survey of the approaches to the Kuskokwim River, Alaska, and in the survey of Icy Strait.

The steamer *Yukon* cooperated with the *Explorer* in the survey of the approaches to the Kuskokwim River.

The steamer *Patterson* was engaged in surveys in the Shumagin Islands and the vicinity of Unimak Pass and search for the reported

Leonard and Anderson rocks, coast of Alaska, and during the winter season continued hydrographic surveys in the Hawaiian Islands.

The steamer *McArthur* was employed in surveys on the west shore of Cook Inlet, Alaska.

The steamer *Taku* was employed in surveys in Prince William Sound, Alaska, and made a special examination at the head of Passage Canal.

The steamer *Gedney* was employed on general surveys on the west coast of Prince of Wales Island, Alaska, including Bucarelli Bay, Klawak Inlet, Tonawek Bay, Sukwan Strait, and Mears Passage, Alaska.

Philippine Islands.—An officer of the Survey detailed to duty as director of coast surveys, with headquarters at Manila, has direction of all field work in the Philippine Islands. The details of this work are mentioned elsewhere in this report.

The steamers *Pathfinder*, *Research*, *Romblon*, *Marinduque*, and *Fathomer* were engaged in that work. Of these vessels all except the *Pathfinder* are the property of the insular government, which provides the crews and keeps the vessels in repair. The salaries of the officers and the running expenses, including outfit of the *Romblon* and *Marinduque*, are paid by the United States. The running expenses of the *Fathomer* and *Research* are paid by the Philippine government.

The steamer *Pathfinder* was employed on general surveys on the east coast of Mindanao and in the approaches to Manila Bay.

The steamer *Research* was employed in the region of the Samar Sea.

The steamer *Romblon* made surveys in the Calamianes and northern Palawan.

The steamer *Marinduque* was employed on the east coast of Palawan.

The steamer *Fathomer* was employed in the Sulu Sea and vicinity.

GEODETIC, MAGNETIC, AND TIDAL WORK.

Primary base lines were measured in Colorado, Wyoming, and Tennessee. Reconnaissance for triangulation was made in Washington, Oregon, California, Colorado, Utah, Wyoming, Montana, Arkansas, and Oklahoma. Primary triangulation was extended in Tennessee, Arkansas, and Mississippi. Astronomical latitude determinations were made in South Dakota, North Dakota, Colorado, Wyoming, Montana, and on the Texas-California arc of primary triangulation. Precise leveling was done in Washington, Montana, North Dakota, and Minnesota. Parties were engaged during the year in revising and supplementing the triangulation on the coasts of Maine, Massachusetts, Rhode Island, the District of Columbia, North Carolina, South Carolina, Washington, Oregon, California, Porto Rico, and in the Hawaiian Islands, and in determining the geographic positions of aids to navigation along the Atlantic and Pacific coasts and in Porto Rico.

Pendulum observations for determining the force of gravity were made in the District of Columbia.

Observations of the three magnetic elements were recorded during the year at the magnetic observatories maintained by the Survey at

Cheltenham, Md.; Tucson, Ariz.; Vieques, Porto Rico; Sitka, Alaska; and Honolulu, Hawaii.

Seismograph records were continued at these observatories and daily meteorological observations were made in cooperation with the Weather Bureau. Special rapid-rate registration was maintained on certain term days in compliance with plans adopted for international cooperation. Magnetic observations were made in the field at a large number of stations in the United States and in the Hawaiian Islands, and meridian lines were established where desired by local authorities. Observations were made at sea by vessels of the Survey in the course of surveying operations. Magnetic information has been supplied in reply to a large number of requests from engineers, surveyors, and others interested.

Tide observations were made in connection with hydrographic surveys in the United States and its outlying territory, and at regular tide stations at Portland, Me.; Fort Hamilton, N. Y.; Atlantic City, N. J.; Philadelphia, Pa.; Baltimore, Md.; Key West, Fernandina, and Cedar Keys, Fla.; Galveston, Tex.; San Diego and San Francisco, Cal.; Seattle, Wash.; and Juneau, Alaska. Tidal indicators exhibiting automatically the stage and height of the tide were maintained at Fort Hamilton, N. Y.; New York City; and Reedy Island, Delaware River.

Through the cooperation of the Bureau of Lighthouses current observations were made at a number of light vessels along the Atlantic coast. Similar observations were made when practicable by the hydrographic parties of the Survey.

INTERNATIONAL BOUNDARIES.

UNITED STATES AND CANADA BOUNDARY.

A Canadian party to which an American surveyor was attached continued the survey and demarcation of the boundary from northwest angle of Lake of the Woods to the southward. Two schemes of triangulation were carried down the lake, one following the boundary and the other covering the main portion of the lake and connecting with the triangulation by an American party. A triangulation was carried 12 miles up Rainy River. Reference monuments were set in Lake of the Woods and in Rainy River, and soundings were made along the boundary in Lake of the Woods and up Rainy River to Baudette.

The party that had been engaged in the triangulation of the forty-ninth parallel and Lake of the Woods was transferred to the vicinity of Fort Frances, Ontario, to take up the triangulation of Rainy River. A base had been measured at Fort Frances and signals erected. Two schemes of triangulation were carried up Rainy River, the larger one with sides of 3 to 10 miles in length, for the purpose of bringing the work up from the Warroad base, and the smaller one following the banks of the stream. The main scheme was begun at Fort Frances and International Falls. Twenty-five stations were occupied in the main triangulation. An azimuth was determined and the base at Warroad was remeasured.

Another party, to which a Canadian surveyor was attached, engaged in triangulation, topography, monumenting, vista cutting, and

leveling on Lake of the Woods and Rainy Lake, continued work on Rainy Lake after the beginning of the fiscal year. During the season of 1913 the topography of Rainy Lake, including Black Bay, was completed from the outlet at Ranier eastward through Brule Narrows and reference marks were set on Rainy Lake; the large-scale mapping of Rainy River was completed from one-half mile below International Falls to the outlet of Rainy Lake at Ranier, and a small scheme of triangulation carried up the river; the large-scale topography of Four Mile Bay and the mouth of Rainy River was completed.

One thousand two hundred islands in the western part of Rainy Lake were mapped; a base line was measured at Fort Frances, Ontario; the reconnaissance for triangulation was extended through Rainy Lake and Lake Namakan, a distance of 60 miles along the boundary, and the occupation of stations in the triangulation was completed for 30 miles along the lake.

In the season of 1914 to June 30 the topography of Rainy Lake was completed between Brule Narrows and Deers Horn Point. The topography of Rainy River was completed from International Falls to the mouth of Little Fork. The reconnaissance and triangulation were continued on Rainy Lake and Lake Namakan, and a short line of levels was run.

Work on the portion of the boundary between the mouth of the Pigeon River and Lake of the Woods was continued after the beginning of the fiscal year. The survey was carried westward covering Carp, Birch, and Basswood Lakes and the river below to the east end of Crooked Lake. The topography was carried on with the triangulation. The elevations of triangulation stations were determined trigonometrically, and levels were run over the portages. Azimuth was observed at three stations, and a base was measured near Hoist Portage.

On the Maine-Quebec boundary, work was begun west of St. Pamphile, while at the same time a Canadian party took up the survey of the southwest branch of St. John River. A 30-foot lane was cut through the forest from west of English Lake to the intersection of the boundary with the southwest branch of the St. John River, and this portion of the boundary was measured, surveyed, and monumented. Observations were made for azimuth and six triangulation stations were occupied. A topographic survey was made of the country immediately adjacent to the boundary.

The party engaged in the survey of the boundary line between Maine and New Brunswick in the valley of the St. Croix River made a large-scale topographic survey from the large iron monument at the head of the river to the northern end of the survey made in 1913. This survey includes all characteristic features of the stream necessary for locating the boundary. Surveys were also made of the valley of Clendenning Brook, the principal affluent of Monument Brook, for a distance of about one-half mile above the junction of the two streams.

Afterwards the party removed to Eastport and, in conjunction with a Canadian party, located and established range marks in the sections of the international boundary included between the center of Grand Manan Channel and the mouth of the St. Croix River.

ALASKA BOUNDARY.

During the season of 1913 the monuments on the one hundred and forty-first meridian boundary between the Yukon River and Mount Natazhat were inspected and numbered, the positions of the monuments verified, and new monuments interpolated where necessary. This work was done by a joint American and Canadian party. During the season 210 miles of the boundary were covered, 35 stations were occupied, 84 monuments were inspected and numbered, 8 new monuments were interpolated, and 9 stations occupied for magnetic declination.

The topography of the Chitina Valley and along the one hundred and forty-first meridian between Mount Natazhat and Mount St. Elias was completed, excepting the portion between Mount Anderson and Mount Natazhat. Further progress toward Mount Natazhat was found impracticable at that time. About 305 square miles of topography were surveyed with the plane table and about 600 square miles by the photographic method. A plane-table sheet was completed covering parts of the Logan Glacier and Boundary Ridge in the vicinity of the one hundred and forty-first meridian.

The triangulation was carried up the Chitina River to and across the Chitina Glacier up the Logan Glacier to the one hundred and forty-first meridian; a base was measured near the foot of the Chitina Glacier and connected with the triangulation. The azimuth of a line in the triangulation was determined and observations were also made for astronomic azimuth. Mount St. Elias was connected with the triangulation. Three monuments were set during the season. Three stations near Mount St. Elias were occupied with the phototopographic camera. The party reached an elevation of 16,400 feet on the shoulder of Mount St. Elias, but farther ascent of the mountain was prevented by unfavorable weather. A Canadian party cooperated with the American party in this work.

The survey and marking of the boundary on Portland Canal and in Dixon Entrance was continued by a Canadian party, to which an American surveyor was attached. During the season of 1913 the triangulation of Pearse Canal was connected with the United States Coast and Geodetic Survey triangulation at the east end of Dixon Entrance. From this triangulation five reference marks were established on the Canadian side and the same number on the American side. Two stations were occupied in the primary triangulation of Dixon Entrance. A joint examination by the American and the Canadian surveyors was made of the islets off Cape Muzon and the passages between them for the purpose of locating the initial monument of the boundary. Photographs were obtained and soundings made. A monument was set on the south bank of the Stikine River, and the alignment of a monument on the ridge between Eagle Point monument and monument "D" was verified.

SPECIAL SURVEYS.

Requests were received for special surveys in the following localities: Vicinity of Rockland, Me.; Portland Harbor, Me.; Eel Pond Harbor, Woods Hole, Mass.; Bridgeport Harbor, Conn.; magnetic survey, vicinity of Potsdam, N. Y.; entrance to Delaware Bay, Del.;

triangulation to furnish points for hydrographic survey, special survey between Union Station Plaza and Pennsylvania Avenue, and precise leveling to connect various bench marks in Washington, D. C.; physical hydrographic work in Potomac River, D. C., Md., and Va.; exploration of the sea between Cape Lookout and Bermuda; definition of fishing limits and determination of geographic positions of aids to navigation on coast of North Carolina; line of precise levels in Georgia from Atlanta to the sea; survey of boundary line, Mississippi and Louisiana; oyster beds, Florida; wire-drag examination of channels at Key West, Fla.; survey of oyster beds, Texas; geodetic work for control of geological surveys near one hundred and sixteenth meridian; verification of speed trial course, Bellingham Bay, Wash., determination of aids to navigation, Puget Sound, Wash.; triangulation to furnish points for municipal survey, Portland, Oreg.; survey of fishing banks south and west of Yaquina Bay, Oreg.; survey of coast in vicinity of Trinidad, Cal.; survey of Yaquina Bar, Bay, and River, Oreg.; survey of Columbia River, Oreg.; surveys of channels and harbors in Alaska; wire-drag examination for hidden dangers and surveys on special localities; survey of Passage Canal, Alaska; location of rock on which steamer *State of California* struck in Gambier Bay, Alaska; survey of Agusan River, Mindanao, P. I.

DANGERS TO NAVIGATION.

Dangers to navigation were discovered, investigated, or reported by vessels or parties of the Coast and Geodetic Survey as follows: shoals in the approaches to Penobscot Bay, Me.; shoals and ridges in Portland Harbor, Me.; ledges in Matinicus Harbor and approaches, Me.; rocks in Piscataqua River, N. H.; rocks in Narragansett Bay, R. I.; rock near Great Point Light, R. I., struck by lighthouse tender *Anemone*; rock off wireless station, Harbor of Refuge, Point Judith, R. I.; rock near Stonington Point, Conn.; rock in Pine Island Channel, Conn.; breakwater off Sachems Head, Conn.; rocks at entrance to Mystic River, Conn.; rocks near Groton Long Point, Conn.; rocks eastward of Branford Harbor, Conn.; rocks near Duck Island, in Joshua Cove, Conn.; shoal spot off the Battery, Hudson River, N. Y.; shoal in New York upper bay and Buttermilk Channel, N. Y.; shoal spot in Kill Van Kull, N. Y.; uncharted rocks in Echo Bay, N. Y.; rocks in Block Island Sound, Gardners Bay, New York Bay, and Hudson River, N. Y.; obstruction near Holly Beach life-saving station, N. J.; rock off Easbys Point, Potomac River, D. C.; reported shoal spot off St. Augustine Inlet, Fla.; danger near Key West Harbor, Fla.; rocky reef above Warriors Point Light, Wash.; shoal off Eliza Island, Bellingham Bay, Wash.; rock on which steamer *Princess Maquina* struck in Yakutat Bay, Alaska; reported Leonard and Anderson Rocks, Alaska; shoal at entrance to Iniskin Bay, Alaska; shoal off Rocky Cove, Alaska; rock in Tonawek Bay, Alaska, on which the steamer *Curacao* was wrecked; rock at entrance to Tenakee Inlet, Alaska; shoal in San Alberto Bay, Alaska; rock on which steamer *State of California* struck in Gambier Bay, Alaska; submerged rock off Prince of Wales Island, Clarence Strait, Alaska; obstructions in Nichols Passage, Alaska; rock near Rocky Island Light, Alaska; rocks in Marble Passage, Alaska; rock on west coast of

Heceta Island, southeastern Alaska; rock in Bay of Pillars, Chatham Strait, Alaska; shoal spot near southeast end of Klawak Reef, Alaska; rock in Hidden Inlet, Pearse Channel, Alaska; rock in Rose Inlet, Alaska, on which steamer *Delhi* grounded; rock in Davidson Inlet, Alaska; rock in Excursion Inlet, Alaska; uncharted shoal in passage north of Bird Island Reef, entrance to Port Graham, Alaska; sunken rock in Kaigani Harbor, Alaska; rock off Bar Point, near Ketchikan, Alaska; Rock off South Inian Pass, Alaska; rocks in Chapin Bay, Frederick Sound, and Deep Bay, Peril Strait, Alaska; shoal at the entrance to Great Harbor, Porto Rico; shoals in Fajardo Harbor, P. R.; shoals in Mindoro Strait, P. I.; shoal on which steamship *Bustamente* was reported to have struck at Port Laguimanoc, P. I.

OFFICE WORK.

The work of the Coast and Geodetic Survey office includes, besides administrative details, all operations necessary for the preparation and publication of charts, coast pilots, tide tables, notices to mariners, reports and special publications which give the results of triangulation, precise leveling and magnetic work, except printing and binding, which is done at the Government Printing Office. These operations include the reduction and plotting of results obtained in the field, computing, drawing, engraving, lithographing, photographing, electrotyping, and chart printing. Instruments used by the field parties are repaired and in some cases constructed in the office, which has a complete equipment for mechanical work.

The proceeds of sales of charts and publications during the year amounted to \$15,218.92, and miscellaneous receipts (work done for outside parties, sale of property, etc.), to \$5,732.55, making a total of \$20,951.47, which was duly covered into the Treasury.

OFFICE OF INSPECTOR OF HYDROGRAPHY AND TOPOGRAPHY.

The Inspector of Hydrography and Topography has supervision over the work of parties on the surveying vessels and all other hydrographic and topographic work, including coast-pilot work in field and office, and is charged with various duties relating to the repair and equipment of the vessels of the Survey.

The field work done by the coast-pilot parties is referred to under another head in this report.

The office work done included the proof reading and indexing of Coast Pilot, Section D, Cape Henry to Key West; the compilation of Coast Pilot, Part IV, Point Judith to New York; the preparation of supplements for the present edition of Part IV and for Alaska Coast Pilot, Part I, and preparing corrections for other volumes.

Considerable time and attention have been given to a critical examination of the charts and of the original sheets from which they were prepared, with a view to planning future work and the preparation of instructions to hydrographic parties.

VESSELS AND PARTIES.

The steamer *Bache* made a detailed hydrographic survey at the entrance to Chesapeake Bay in conformity with a request of the

War Department, and afterwards was employed on oceanographic work in cooperation with the Bureau of Fisheries between the Capes of Virginia, Bermuda, and Cuba. Prior to this work a radio apparatus was installed on the vessel, and necessary repairs were made. After completing this work a resurvey was made of the channel east of Sabine Bank Lighthouse and a search was made for a reported 10-fathom bank in the Gulf of Mexico about 100 miles from Tampa. A depth of 14 fathoms was found in this locality and a wreck in 18 fathoms with mast protruding 3 feet above water was discovered in latitude $28^{\circ} 13'$, longitude $83^{\circ} 43'$. The next work undertaken was offshore hydrography on the coast of South Carolina in the vicinity of Cape Romain, which was in progress at the close of the year.

The steamer *Endeavor* continued the revision of hydrography of Narragansett Bay, R. I.; made an examination of Ricord and Cape May Channels, N. J.; a resurvey of St. Helena Bay, S. C., and at the mouth of the Cape Fear River, N. C.; and at the close of the year was engaged in surveying the shoals off Cape May, N. J.

The steamer *Hydrographer* was engaged in coast-pilot work between Point Judith and New York and made resurveys of Great Salt Pond and of Block Island north reef. Many uncharted rocks were located and an examination was made of a shoal off Whitestone Point. During the winter season the *Hydrographer* was employed in surveys in the sounds of North Carolina, and afterwards on supplementary hydrography in Long Island Sound, and in chart revision at Elizabeth, N. J., and in vicinity of New York, including search for a reported rock one-half mile south by east from Fort Hamilton.

The schooner *Matchless* completed the survey of Elizabeth River, Va., and has since been engaged in the revision of the inshore hydrography along the eastern shore of Chesapeake Bay from the vicinity of Fishermans Island to the northward.

A close hydrographic resurvey was made of the inner and outer harbors of Delaware Breakwater.

A hydrographic survey of Piscataqua River and Great Bay, N. H., was completed.

A revision was made in the field of the coast-pilot notes for the Potomac River, and from Cape Henlopen southward and up the west shore of Chesapeake Bay from Cape Charles. This work was completed to and including the Choptank River.

An investigation was made to determine the condition of the navigable inside waterways east of the Mississippi River, including an examination of water routes across Florida. An examination was also made at Eau Gallie, Fla.

Examinations with the wire drag were made in the vicinity of Matinicus, Me.; in the approaches to Portland Harbor, Me.; in the approaches to Rockland Harbor; in the approaches to the Cape Cod Canal in Buzzards Bay, Mass.; in Duck Island Harbor of Refuge, Conn., and its approaches; and in the vicinity of Key West, Fla.

Chart-revision work was done in Newark Bay and Hackensack and Passaic Rivers, N. J.; on the south shore of Long Island, N. Y., including a resurvey of Jamaica Bay; on Alligator River, N. C.; on Cohasset Bay, Mass.; and at St. Augustine Inlet, Fla.

Current observations and other physical hydrographic work in the Potomac River from the Chain Bridge, D. C., downstream was

undertaken at the request of the Public Health Service with special reference to determining the effect of the sewage of Washington on the fish and shellfish of the river.

During the first half of the fiscal year cooperation was continued with the Maryland Shell Fish Commission in the preparation of reports and maps for publication and the completion of records for the archives. This work was closed early in November.

Inspection duty for the region between Narragansett and Delaware Bays was continued by an officer of the Survey with headquarters in New York City.

FIELD WORK, PACIFIC COAST.

The steamer *Explorer* was employed in surveys of the approaches to the Kuskokwim River, Alaska; in Excursion Inlet and Icy Passage; location of rock in Inian Passage; and survey of Knik Arm, Alaska.

The steamer *Gedney* and launch *Cosmos* made surveys on the west side of Prince of Wales Island, Alaska, and determined the position of rocks in Gambier Bay, on one of which the steamer *State of California* had been wrecked. A channel was developed from Tuxican Bay to Sea Otter Sound. During the winter this vessel was engaged in revision work at Seattle and in Bellingham Bay, Wash.

The steamer *McArthur* made surveys on the west side of Cook Inlet, located a reported rock in Hidden Inlet, and began surveys in Nichols Passage, Alaska.

The steamer *Patterson* was employed on surveys in the vicinity of the Shumagin Islands, Alaska, and in hydrographic examinations in the region of the reported Leonard and Anderson rocks. It was concluded that these dangers do not exist. After the close of this work the *Patterson* was employed on the survey of the Hawaiian Islands, including the islands of Oahu, Maui, Lanai, and Hawaii. The survey of the Shumagin Islands was resumed in the spring of 1914.

The steamer *Taku* was engaged upon surveys in Simpson Bay, Prince William Sound, Alaska; Sheep Bay, Gravina Bay, Passage Canal, Chamberlain Bay, and Jackson Cove; and Landlocked Bay.

During the winter the triangulation of Lake Washington, Wash., was revised.

The steamer *Yukon*, in cooperation with the *Explorer*, continued the survey of the approaches to the Kuskokwim River, Alaska.

The hydrography of Carquinez Strait, Suisun Bay, and Sacramento River, Cal., was revised.

Chart-revision work was also done on the southern coast of California southward from Newport Bay.

A survey of Yaquina Bay, Oreg., was begun.

A wire-drag party was organized for work in Tongass Narrows, southeast Alaska.

The revision of the triangulation and topography of the island of Hawaii was continued.

An officer of the Survey continued on duty as inspector for the coast of California and in charge of the suboffice at San Francisco. Another officer with an office at Seattle has rendered efficient service as inspector for the coasts of Oregon, Washington, and Alaska.

PHILIPPINE ISLANDS.

All field work in the Philippine Islands is done under the immediate direction of an officer of the Survey assigned as director of coast surveys at Manila, P. I.

The steamer *Pathfinder* was at work on the east coast of Mindanao between Lianga and Caraga Bays and in the approaches to Manila Bay. A radio apparatus was installed on this vessel.

The steamer *Fathomer* was employed during the year on surveys on the east side of Busuanga in the general region between Mindoro, Busuanga, Calaamianes, and the Cuyos Islands.

The steamer *Marinduque* was engaged in general surveys on the east and northeast coasts of Palawan Island.

The steamer *Romblon* was also at work on the east and northeast coasts of Palawan and in the region of the Calimianes Islands.

The steamer *Research* was engaged in surveys in the southern approaches to San Bernardino Strait, including Masbate, Ticao, and other islands.

OFFICE OF INSPECTOR OF GEODETIC WORK.

The duties of inspection are performed at the Coast and Geodetic Survey office and in the field. They consist mainly in planning field work, preparing the necessary instructions for field parties and correspondence relating to details of field operations, examination of records, computations and reports, scientific investigations based on the results of the field observations and computations in the computing division and preparation for publication of the results of field and office work done under his direction for the use of engineers and scientists.

The inspector has also assisted the international boundary commissioner by inspecting the records and computations of triangulation and the reports of field parties engaged in the survey of the boundaries between the United States and Canada. He attended the meeting at Atlanta, Ga., of the American Association for the Advancement of Science, as one of the representatives of the Department of Commerce.

The most important pieces of geodetic work done in the field during the fiscal year are the following:

The completion of 25 latitude stations on the one hundred and fourth meridian, by one party in about two and one-half months. The points occupied were stations of the arc of primary triangulation along that meridian, which had been established in previous years. The chief of this party used an automobile truck as a means of transportation, and it was due largely to this and to the good judgment shown by him, as well as to the fact that after the first few stations he was not required to make any computations on the field, that his party made such rapid progress. A series of latitude observations is now being made along the Texas-California arc of primary triangulation, from the vicinity of Barstow, Tex., westward.

The completion of the reconnaissance for an arc of primary triangulation which will extend from the vicinity of the Salt Lake base net northward to the Canadian boundary. This work is 555

miles in length, and provision has been made for connections with a number of monuments of previously conducted surveys and with several State boundary monuments. A connection has also been provided for with the triangulation along the forty-ninth parallel, done by the International Boundary Commissions. Some of the figures of this triangulation are rather large, but in order that the work may be of the greatest value to the topographers and others who will use the results of this triangulation the reconnoissance party interpolated a number of additional stations which will not be occupied. This reconnoissance was done in exactly two months, which is very rapid progress.

The reconnoissance for primary triangulation, which will extend from Little Rock, Ark., westward through Oklahoma, to a junction with the ninety-eighth meridian. This reconnoissance also provides for connections with the monuments of previous surveys and with those of the Oklahoma-Arkansas boundary.

Precise leveling by the two leveling parties, one working from Butte, Mont., northward to the Canadian border, and the other party working from Crookston, Minn., westward to Berthold, N. Dak. This work was done with remarkable rapidity, although the usual accuracy of the Coast and Geodetic Survey leveling was maintained. The average progress of a leveling party during a number of seasons in the past was about 70 miles per month. During September and October, 1913, one party completed 100 and 101 miles, respectively. During the same months the other party completed 99 and 105 miles, respectively. Each of these miles of progress was run twice by the leveling party, once in a forward and once in a backward direction. The use of the motor velocipede cars by these two parties had a great deal to do with the rapid progress, but much was due to the two officers who had charge of this work. The same two chiefs of party are now engaged on leveling, westward from Butte to Spokane, and from Berthold, N. Dak., to Devon, Mont.

Another important piece of work which was begun during the fiscal year was the triangulation between Grays Harbor and the Straits of Fuca along the coast of Washington. This portion of the State had never previously had any geodetic control. The reconnoissance and signal building for this work was completed and the observing at the northern end begun. At the approach of winter the work was suspended.

A difficult piece of work was the triangulation between the tertiary work in Oregon southwest to the junction with the tertiary triangulation along the coast in the vicinity of Redding Rock. The reconnoissance and signal building and most of the observing for horizontal directions in this work was completed during the summer of 1913. During the spring of 1914 all of the observations in this triangulation were completed. At the close of the fiscal year the triangulation was resumed on the western coast of Washington, which had been suspended in the fall of 1913.

The important work of determining difference of telegraphic longitude to connect the Naval Observatory, Washington, D. C., and the Cambridge, Mass., observatory, with a point near Far Rockaway, Long Island, N. Y., which latter place will be connected by

the observers of the Prussian Royal Geodetic Institute with Borkum, Germany, by cable, was begun before the close of the fiscal year.

It was found by observations made in this year that it would be possible to use the noon signals sent out by the United States Naval Observatory, over the wires of the Western Union Telegraph Co., in the determination of the periods of pendulums in gravity work. This method was given a severe test at this office by an officer of the Dominion Astronomical Observatory, Ottawa, Canada, who determined the periods of his pendulums at two different times at this office in connection with the relative determination of gravity at Ottawa. He used both his own time observations, made at a station near the Coast and Geodetic Survey office, and also the noon signals of the Naval Observatory. He found that the period of his pendulum was the same by the use of each time. This will greatly increase the rapidity of pendulum observations.

The erection of signals and the observations for primary triangulation on the arc of triangulation which will extend between Memphis, Tenn., and Huntsville, Ala., are in progress. When this scheme has been completed, it will be possible to place all of the triangulation of the Mississippi River on the North American Datum, as connections between the triangulation of this river and the primary triangulation of the United States will then have been made at New Orleans, La.; Memphis, Tenn.; St. Louis, Mo.; Dubuque, Iowa; and Royalton, Minn. The triangulation along the Mississippi River is of a high grade of tertiary triangulation, almost approaching secondary, and will be of great geographic value as soon as it has been recomputed and adjusted.

Other work done under the inspector of geodetic work was the following:

Triangulation in Porto Rico for the determination of geographic positions of aids to navigation on Culebra Island.

Revision of triangulation and re-marking of stations on Lake Washington, Wash.

Determination of geographic positions at the mouth of the North Edisto River, S. C.

The triangulation of the Columbia River. A number of connections with triangulation stations of the United States engineers were made during this work. This triangulation was done at the request of the Bureau of Lighthouses that the geographic positions of all aids to navigation on the river be determined.

Measurement of the Cheyenne base, in Wyoming, and the re-measurement of the El Paso base, Colo. The primary triangulation, including only four stations, which was done to connect the Cheyenne base with the main scheme of the one hundred and fourth meridian.

The revision of triangulation and the re-marking of old stations along the coast of Maine south of Passamaquoddy Bay.

The location of an exact line between the Union Station and the Peace Monument, Washington, D. C.

The revision of triangulation and the re-marking of old stations in Narragansett Bay, R. I., and in the vicinity of Portland, Me.

The revision of triangulation, which practically amounted to a new triangulation, in Alligator River and North River, S. C. It was necessary to do some triangulation in Albemarle Sound to provide bases from which to start this work.

The revision of triangulation, which also amounted to a new triangulation, on the coast of North Carolina, between Bogue Sound and Cape Fear River. It was found by each of these parties in North Carolina that practically all of the old triangulation stations had been destroyed and that new work was necessary.

The determination of the geographic position of the wireless tower in the vicinity of Tuckerton, N. J.

Precise leveling between the Capitol bench mark and the Aqueduct Bridge in the District of Columbia. This work was done at the request of the District Engineer, Corps of Engineers, United States Army.

The geodetic work is being extended as rapidly as possible and, wherever practicable, new work is done in those areas where it will be of greatest value to other Government organizations needing the results obtained therefrom. While every means is used to increase the output and lower the unit costs of the several branches of geodetic work, at the same time the usual high standard of accuracy has been constantly maintained.

The publications on geodetic subjects which were issued during the fiscal year are listed under the head of "Publications," in another part of this report.

The manuscript has been prepared for the following two publications:

The Results of Triangulation on the One Hundred and Fourth Meridian and the Thirty-ninth Parallel in Colorado, Utah, and Nevada. This has been sent to the printer and will appear as Special Publication No. 19.

The Results of Precise Leveling Between Brigham, Utah, and San Francisco, Cal. This publication also contains a discussion of the errors of precise leveling. It will appear as Special Publication No. 22.

OFFICE OF INSPECTOR OF MAGNETIC WORK.

The duties of this office are to plan magnetic work to be done in the United States and outlying territory under the jurisdiction of the United States; to inspect magnetic field work on land and at sea and at the magnetic observatories; to recommend the construction or purchase of new magnetic instruments, or alteration of old ones when required, or the designing of new ones; to recommend changes in the design of magnetic instruments, or methods of observing, to secure improved results or to save time; to supervise the planning and construction of magnetic observatory buildings, etc.

In November the Cheltenham Observatory was visited and inspected. All other inspection work during the year was performed at the office through current examination of the records when received from the field, and reports from chiefs of parties and others engaged in magnetic work. The magnetic parties transmit their records to the office about twice a month, and the observatory records are transmitted monthly.

The magnetic work accomplished during the year may be summarized as follows:

At Cheltenham Observatory the magnetographs and seismograph were kept in operation without appreciable interruption, and all of the required observations and records secured. The usual meteorological observations were made. The number of magnetic storms remained small though the sun-spot minimum period is now well past. Less than 20 earthquakes were recorded by the Cheltenham seismographs, nearly all of which were of small amplitude and distant origin. This was seismically the quietest year at Cheltenham since the installation of the instruments.

Harold W. Pease, magnetic observer, was given instruction in observatory work and the duties of a chief of party.

All of the instruments used in the field work during the year were standardized at the Cheltenham Observatory, and an indirect comparison made with the Porto Rico Magnetic Observatory. The standard earth inductor and standard magnetometer of the department of terrestrial magnetism of the Carnegie Institution, of Washington, were compared with the Cheltenham standards. The agreement of the Cheltenham standards with the now adopted international standard of the Carnegie Institution is quite satisfactory for declination and horizontal intensity, but there remains a difference of about one minute in the dip which is not yet satisfactorily accounted for. More evidence on this point will be had when a new earth inductor, now ordered, is received and compared at Cheltenham after previous comparisons at Potsdam, Germany.

The necessary repairs to buildings, fences, repainting, etc., were made. The instrument equipment is in good condition and giving satisfactory results.

At Tucson Magnetic Observatory, the magnetic and seismograph instruments were in successful operation and all required observations were secured. Daily meteorological observations were made during the entire year and reported daily by telephone to Tucson, to be telegraphed to the local weather office at Phoenix, Ariz.

Less than 25 earthquakes were recorded during the year, which shows, like Cheltenham, a year of less seismic disturbance than in the past.

The observatory buildings were kept painted and in good condition, and the instruments in good working order.

Some special azimuth observations were made; also comparison of one set of field instruments. The chronometer corrections were usually obtained about once a week from the Mare Island time signals transmitted to the observatory by telephone from the Tucson Western Union telegraph office.

At the Honolulu Magnetic Observatory, the Eschenhagen magnetograph and seismograph were in operation all the year without material interruption, and the necessary absolute observations, scale-value determinations, and daily meteorological observations were made and sent to the local section of the Weather Bureau at Honolulu. Exchange of meteorological reports were made with the Ewa Plantation Co. as heretofore.

Two sets of field instruments were compared during the year, used in the magnetic resurvey in the Hawaiian Islands, including special

work at Kilauea, and the other was that belonging to the Coast and Geodetic Survey steamer *Patterson*, at that time engaged on survey work in the Hawaiian Islands.

Earthquake data were furnished to the director of the Hawaii Volcano Observatory, as requested last year.

The necessary repairs to the observatory buildings to keep them in good condition were made. The road from the observatory to the post office, however, remains in poor condition.

At the Sitka magnetic observatory, the magnetograph and seismograph were in continuous operation throughout the year. The required absolute observations, scale-value determinations, and time observations were secured. About 25 earthquakes were recorded during the year, a less number than in previous years.

One set of field magnetic instruments were compared, namely, those that had been used in the field work in the Southwest and Pacific Coast States. At the beginning of the season this set of instruments was compared at Cheltenham, and during the season at Tucson, thus obtaining control of the correction to these instruments through three observatories.

The observatory buildings have been kept in good condition, and the instrumental equipment is in good working order and giving satisfactory results.

At the Porto Rico Magnetic Observatory the magnetograph and seismograph were kept in operation throughout the year, and all of the required observations were made. One field magnetometer was compared at this observatory for the purpose of an intercomparison of the absolute instruments with those at Cheltenham.

An unusually small number of earthquakes were recorded. The necessary painting, minor repairs, and improvements to the buildings for their proper upkeep were made. The instrumental outfit is in good order and satisfactory results are being obtained.

MAGNETIC WORK ON LAND.

The magnetic elements (declination, dip, and horizontal intensity) were determined at about 308 stations. The stations were distributed, in accordance with what seemed the most urgent needs, over 37 States and Territories and outlying territory under the jurisdiction of the United States. Fifty-nine "repeat" stations were occupied during the year for the purpose of getting observational data for maintaining the necessary knowledge of the secular change of the magnetic elements, especially the declination. The field work in Hawaii last summer, with the exception of the special magnetic survey of Kilauea Volcano, was exclusively repeat work for secular-change data:

The table following shows how the stations were distributed throughout the country:

SUMMARY OF RESULTS ON LAND.

| State. | Localities. | Stations. | Old localities re-occupied. | Declination results. | Dip results. | Intensity results. |
|---------------------|-------------|-----------|-----------------------------|----------------------|--------------|--------------------|
| Alabama..... | 5 | 5 | 1 | 5 | 5 | 5 |
| Alaska..... | 18 | 18 | 2 | 19 | 5 | 5 |
| Arizona..... | 2 | 2 | 2 | 3 | 3 | 3 |
| Arkansas..... | 9 | 9 | 1 | 9 | 9 | 9 |
| California..... | 8 | 10 | 6 | 10 | 10 | 10 |
| Colorado..... | 17 | 17 | 3 | 17 | 17 | 17 |
| Connecticut..... | 5 | 5 | 1 | 5 | 5 | 5 |
| Delaware..... | 19 | 22 | 1 | 22 | 22 | 22 |
| Florida..... | 19 | 22 | 4 | 22 | 22 | 22 |
| Georgia..... | 14 | 15 | 2 | 15 | 15 | 15 |
| Hawaii..... | 14 | 41 | 9 | 37 | 36 | 36 |
| Idaho..... | 1 | 1 | 0 | 1 | 1 | 1 |
| Iowa..... | 4 | 17 | 0 | 17 | 19 | 17 |
| Louisiana..... | 2 | 2 | 2 | 2 | 2 | 2 |
| Maryland..... | 1 | 1 | 1 | 6 | 6 | 6 |
| Massachusetts..... | 2 | 2 | 1 | 2 | 2 | 2 |
| Michigan..... | 7 | 9 | 1 | 9 | 7 | 7 |
| Minnesota..... | 4 | 4 | 0 | 4 | 4 | 4 |
| Mississippi..... | 2 | 2 | 1 | 2 | 2 | 2 |
| Missouri..... | 1 | 2 | 1 | 2 | 2 | 2 |
| Montana..... | 2 | 2 | 1 | 2 | 2 | 2 |
| Nebraska..... | 1 | 1 | 1 | 1 | 1 | 1 |
| New Hampshire..... | 7 | 7 | 0 | 7 | 7 | 7 |
| New Jersey..... | 10 | 11 | 0 | 11 | 11 | 11 |
| New Mexico..... | 2 | 2 | 2 | 2 | 2 | 2 |
| New York..... | 17 | 19 | 3 | 19 | 19 | 19 |
| North Carolina..... | 1 | 1 | 0 | 1 | 1 | 1 |
| Oregon..... | 8 | 11 | 2 | 11 | 10 | 11 |
| Pennsylvania..... | 2 | 2 | 0 | 2 | 2 | 2 |
| Philippines..... | 5 | 5 | 0 | 5 | 0 | 0 |
| Tennessee..... | 2 | 2 | 2 | 2 | 2 | 2 |
| Texas..... | 4 | 5 | 3 | 5 | 5 | 5 |
| Utah..... | 8 | 8 | 2 | 8 | 8 | 8 |
| Vermont..... | 3 | 3 | 0 | 3 | 3 | 3 |
| Virginia..... | 1 | 1 | 1 | 1 | 1 | 1 |
| Washington..... | 1 | 1 | 1 | 1 | 1 | 1 |
| Wisconsin..... | 19 | 20 | 2 | 20 | 19 | 19 |
| Total..... | 247 | 308 | 59 | 310 | 288 | 289 |

MAGNETIC WORK AT SEA.

The magnetic work carried out at sea by vessels of the Survey was, as heretofore, incidental to the regular surveying work, and the magnetic observations were made when the vessels were en route to or from their working grounds, or when opportunity occurred on the working grounds. The ship's routes have covered little new territory in the last year or so and the ship's results are not so numerous as during some past years. The table below gives, approximately, the magnetic results secured aboard ship during the year, so far reported to the office:

SUMMARY OF RESULTS AT SEA.

| Vessel. | General region. | Results from swings. | | | Declination from course observations |
|-------------------|---------------------|----------------------|-------|------------|--------------------------------------|
| | | Declination. | Dip. | Intensity. | |
| Hydrographer..... | Atlantic Ocean..... | 22 | ..... | ..... | ..... |
| Becke..... | do..... | 8 | ..... | ..... | ..... |
| Patterson..... | Pacific Ocean..... | 10 | 6 | 6 | 1 |
| Explorer..... | do..... | 1 | 1 | 1 | ..... |
| McArthur..... | do..... | 7 | ..... | ..... | ..... |
| Total..... | ..... | 48 | 7 | 7 | 1 |

* Seven for 1912 not previously reported.

Each vessel of the service suitable for magnetic work is instructed each season to make magnetic observations, especially for magnetic declination, whenever the conditions of weather and of the regular duties will permit. The *Patterson* and the *Explorer*, on the Pacific coast, are supplied with sea-dip circles for observations of dip and relative total intensity, and are equipped with field magnetometers for observations on land.

A new earth inductor was ordered, but not yet received, which is intended to be used especially for intercomparison observations between the Cheltenham standard dip instrument and the dip instruments at the other four observatories of the Coast and Geodetic Survey. This instrument can also be used as a relief instrument in case any of the observatory earth inductors should need to come to the office for repairs. A new India survey pattern magnetometer has been ordered (but not yet delivered), which is intended primarily to be used for periodic comparison with the Cheltenham standards in order to keep ourselves informed as to the stability of those standards. The instrument division is still considering the question of making dip needles and it is expected that it will soon succeed in turning out needles that will meet present-day requirements. A new form of magnetogram reading scale (on plate glass) has been made in the instrument division, after design of this division, by the use of which it is intended, at the beginning of 1915, to read the mean ordinate of the magnetic curves, instead of the ordinate at the beginning of each hour. With this scale it is believed that the mean ordinates can be read as quickly as the ordinates at the hour are now read, and with the advantage that the mean ordinates more nearly represent the actual magnetic conditions that ought to be dealt with in the discussion of the results.

During the year a field party reoccupied a number of old magnetic stations in the Hawaiian Islands for secular change data. In connection with this work it was also convenient to undertake a special magnetic survey of Kilauea Volcano requested by the director of the Hawaiian Volcano Observatory.

During the year the standard absolute instruments of the department of terrestrial magnetism of the Carnegie Institution of Washington were compared with the Cheltenham standards. The magnetic declination and horizontal intensity results were found to hold the same relations as heretofore, but there was a disagreement in the determination of dip of about one minute, which yet remains unexplained. Several indirect comparisons of the Cheltenham earth inductor with the Potsdam, Germany, standard in past years supported the view that the Cheltenham instrument had remained stable. However, the observer in charge at Cheltenham has overhauled the adjustments of the earth inductor, supplied new brushes, and tested their adjustment in accordance with the theory of the subject. Further opportunity to test the stability of this instrument will be afforded upon the receipt of a new earth inductor, now ordered, which will have been compared at the Potsdam Magnetic Observatory. Other indirect comparisons of observatory instruments with Cheltenham have been made at magnetic observatories at Vieques, Tucson, Sitka, and Honolulu.

Only about 20 true meridian lines were established during the year. These lines were all established at the request of the local authorities.

APPROPRIATIONS AND DISBURSEMENTS.

The total appropriations made by Congress in the sundry civil act for the fiscal year ended June 30, 1914, for the Coast and Geodetic Survey was \$1,021,920, divided as follows:

| | |
|---|--------------------|
| Field expenses..... | \$320, 400 |
| Repairs and maintenance of vessels..... | 40, 000 |
| Officers and men, vessels..... | 252, 200 |
| Pay of field officers..... | 160, 200 |
| Pay of office force..... | 199, 120 |
| Office expenses..... | 50, 000 |
| Total..... | 1, 021. 920 |

| | |
|---|--------|
| New freight elevator in Richards Building (\$4,200 transferred by authority of legislative act of March 4, 1913, for expenditure for this service under title "Contingent expenses, Department of Commerce, 1914")..... | 2, 500 |
|---|--------|

The statement of disbursements required by law to be made annually to Congress and published as a separate document gives an account of the names and number of employees of different classes employed on the work, the amount of their salary or compensation, the length of time employed, to whom payments were made under the different items of appropriation and on what account, and the balances remaining of the amounts appropriated for the fiscal year.

PUBLICATIONS.

The following publications of the Coast and Geodetic Survey were received from the printer during the fiscal year 1914:

Annual report of Superintendent, 1913. 102 p. 15 maps. [Printed also as H. doc. 400, 63d Cong. 2d sess.] 8vo.

Tide tables, [calendar] year 1913 [with list of references]. 542 p. 1l. [Reprint.] large 8vo.

Same, 1914. 542 p. large 8vo.

General tide tables, [calendar] year 1915 [with list of references]. 542 p. 1l. large 8vo.

Tide tables for Atlantic coast of United States, including Canada and West Indies; from Tide tables, [calendar year] 1913. 181 p. 1l. [Reprint.] large 8vo.

Same, 1914. 181 p. large 8vo.

Atlantic coast tide tables for eastern North America, [calendar] year 1915; from General tide tables [calendar year 1915]. 183 p. 1l. large 8vo.

Tide tables for Pacific coast of United States, with foreign ports in Pacific Ocean; from Tide tables, [calendar year] 1913. 165 p. [Reprint.] large 8vo.

Same, 1914. 165 p. large 8vo.

Pacific coast tide tables for western North America, eastern Asia, and many island groups, [calendar] year 1915; from General tide tables [calendar year 1915]. 167 p. large 8vo.

Results of magnetic observations made by Survey, July 1, 1911-Dec. 31, 1912; by R. L. Faria. 1 text fig. (Special publication 15.) 102 p. large 8vo.

Results of observations made at magnetic observatory at Cheltenham, Md., 1911-12; by Daniel L. Hazard. 98 p. 8 charts. 4to.

Same, Honolulu, Hawaii, 1911-12; by Daniel L. Hazard. 99 p. 6 charts. 4to.

Same, Vieques, P. R., 1911-12; by Daniel L. Hazard. 102 p. 7 charts. 4to.

Same, Sitka, Alaska, 1911-12; by Daniel L. Hazard. 100 p. 15 charts. 4to.

United States coast pilot, Atlantic coast: sec. D, Cape Henry to Key West; [compiled by Herbert C. Graves, assisted by E. Vance Miller and J. T. Watkins]. map. [This volume covers same territory formerly included in pt. 7, Chesapeake Bay entrance to Key West.] 231 p. 8vo.

Same: pt. 4, Point Judith to New York [supplement to 5th edition]. May 15, 1914. 10 leaves. large 8vo.

Inside route pilot, New York to Key West, 1913; [by Herbert C. Graves and W. E. Parker]: 66 p. 2d edition. 8 maps in pocket. large 8vo.

Determination of time, longitude, latitude, and azimuth: by William Bowie, 5th edition. 8 pl. 18 p. of pl. (Special publication 14.) [Reprint.] 177 p. 4to.

Triangulation along west coast of Florida; by Clarence H. Swick. 1 pl. 28 maps. (Special publication 16.) 147 p. 4to.

Triangulation on coast of Texas, from Sabine Pass to Corpus Christi Bay; by Charles A. Mourhess. 1 pl. 18 maps. (Special publication 17.) 89 p. 4to.

Fourth general adjustment of precise level net in United States and resulting standard elevations: by William Bowie and H. G. Avers. 4 pl. map. (Special publication 18.) 328 p. 4to.

Table of depths for channels and harbors, coasts of United States, including Porto Rico, Hawaiian Islands, and Philippine Islands. 175 p. 4to.

Summary of survey of oyster bars of Maryland, 1906-12 [carried on by Coast and Geodetic Survey in cooperation with Fisheries Bureau and Maryland Shell Fish Commission]; by C. C. Yates. 81 p. 1 pl. 2 maps in pocket. large 8vo.

Principal facts of the earth's magnetism and methods of determining true meridian and magnetic declination: [by L. A. Bauer]. 7 pl. 5 maps. [From United States magnetic declination tables and isogonic charts, 1902, with certain changes.] [Reprint.] 99 p. large 8vo.

Statement of expenditures in Coast and Geodetic Survey, fiscal year 1913. Jan. 13, 1914. 22 p. 8vo. [H. doc. 580, 63d Cong. 2d sess.]

The total cost of printing and binding for the Coast and Geodetic Survey, including blank forms and miscellaneous job printing for the year, payable from the allotment to the Department of Commerce for printing and binding was \$28,837.49.

SPECIAL DUTY.

International Geodetic Association.—The Superintendent continued to supervise the operations of the observatories maintained by the International Geodetic Association at Gaithersburg, Md., and Ukiah, Cal.

Board on life-saving appliances.—The Superintendent of the Survey is chairman of the board appointed by the Secretary of the Treasury to examine and report upon life-saving appliances.

Mississippi River Commission.—An officer of the Survey, in addition to other duties, has continued to serve as a member of the Mississippi River Commission.

Maryland Shell Fish Commission.—The officer detailed for duty with the Maryland Shell Fish Commission completed the preparation of maps, reports, and publications in connection with that work.

Oceanographic work.—The steamer *Bache*, in cooperation with the Bureau of Fisheries, made a cruise for oceanographic work between the Atlantic coast, Bermuda, and Cuba, and made current observations in the Gulf Stream at a station between Cuba and the Florida coast.

Triangulation, District of Columbia.—Some additional triangulation was done in the District of Columbia to furnish points for a survey of the Potomac River.

Precise leveling, District of Columbia.—At the request of the District engineer, Corps of Engineers, United States Army, Washing-

ton, D. C., a line of precise levels was run connecting various bench marks in the District of Columbia.

Topographic survey of grounds of Bureau of Standards.—A topographic survey was made of the grounds of the Bureau to supplement a former survey and to furnish data for laying out sites for new buildings.

Proposed avenue in Washington, D. C.—At the request of the Attorney General a survey was made from the junction of Pennsylvania Avenue and First Street NW., and the Union Station Plaza, to determine whether a proposed avenue would overlap a portion of square 633.

Physical hydrography, Potomac River.—In cooperation with the Public Health Service an extensive series of current and tidal observations was made in the Potomac River to determine to what extent the tides affect and currents carry the sewage from the vicinity of Washington, D. C., toward the oyster beds in the lower Potomac, the amount of dilution of the river water from fresh water streams or influx of salt water from the Chesapeake, etc.

North Carolina Fisheries.—At the request of the North Carolina Fish Commission buoys were replaced marking the limits of fishing grounds in Albermarle, Croatan, and Pamlico Sounds.

American Association for Advancement of Science.—In December the inspector of geodetic work, as a representative of the Department of Commerce, attended the meeting of the American Association for the Advancement of Science, held at Atlanta, Ga.

DETAILS OF FIELD OPERATIONS.

ATLANTIC COAST.

MAINE, MASSACHUSETTS, AND CONNECTICUT.

[N. H. HECK.]

SUMMARY OF RESULTS.—Triangulation: 293 square miles of area covered, 8 signal poles erected, 25 stations in supplemental schemes occupied for horizontal measures, 41 geographic positions determined. Levelling: 10 permanent bench marks established, 8 miles of levels run. Hydrography: 169 square miles dragged, 16,365 angles measured, 469 soundings made, 3 tide stations established, 7 hydrographic sheets finished, 1 hydrographic sheet begun.

At the beginning of the fiscal year the wire-drag party was at work on the coast of Maine in the vicinity of Matinicus Island in the outer approaches to Penobscot Bay. Progress in this work prior to July 1 is mentioned in the last annual report.

In order to expedite the work and to insure the removal of the lobster pots from the area to be dragged, charts were prepared dividing this area into sections containing about 5 square miles each. These charts were posted in the post offices and other public buildings, and notices were attached from time to time indicating the time for the removal of the lobster pots and the areas completed.

As the areas were sufficient to make possible a full day's work with an 8,000-foot drag where no shoals were found, the work progressed rapidly.

An area of 114 square miles was dragged, and a number of new shoals were found. The principal result of the work was to show

that a large area of bottom is free from obstructions and that the shoal areas are more extensive and generally of less depth than had been shown on the charts.

Investigations were made in Matinicus Harbor and its approaches as the result of local information and a number of shoals were located, the most important of which are a ledge known as White Rock in the north approach and several rocks off Wheatons Island.

It was necessary to make a complete revision of the triangulation. As a number of old stations were recovered only a simple scheme was required in addition to the intersection stations.

On September 2 wire-drag work was taken up in Buzzards Bay and was steadily continued until November 19. Long drag work was carried on until all of the open area was completed. A shorter drag was afterwards used, and later two drags were operated to cover small areas not previously gone over. The total area dragged was about 60 square miles. A portion of the area was left unfinished at the close of the season.

The special characteristic of Buzzards Bay is the frequent occurrence of detached boulders and of well determined ridges of boulders. Many of the isolated boulders are of small extent and difficult to locate.

Areas which previous surveys had indicated as perfectly clear were found to contain boulders at certain intervals. The discovery of all the obstructions in the bay is of importance to shipping destined for the Cape Cod Canal.

It was necessary to extend the triangulation of 1910, by the party on the steamer *Endeavor*, to the mouth of the bay to furnish points for the Survey.

On September 30 a subparty was detailed to make an examination of Duck Island Harbor of Refuge between Menunketesuck Point and Hammonasset Point. The area covered, about 6 square miles in extent, is badly broken by shoals, islands, etc., and subject to strong tidal currents. Here some supplemental triangulation was also necessary. This work was completed by October 23.

On the coast of Maine and on Buzzards Bay search was made for tidal bench marks previously established, and so far as practicable new bench marks were established where necessary and connected by leveling.

Improvements made in methods and equipment for wire-drag work are fully treated in a new edition of the paper descriptive of the long wire drag.

On April 20 preparations were begun for wire drag work in the approaches to Portland Harbor, Me. Dragging was begun on April 7. It was found that a considerable portion of the area to be dragged was exceptionally rocky. Several ridges extending nearly across the entrance with depths of 6 fathoms or less were developed. All of these ridges are in the general direction of the islands of Casco Bay. By June 30 an area of 22 square miles had been covered, but a portion of this required further examination. A small amount of triangulation was done to locate points needed in the survey.

A number of young officers were trained in wire drag work so as to be available for such work in other localities. Improvements have been made in the apparatus used, including an automatic winder for guiding the wire to the reel and an arrangement for controlling

the reel lever from a point near the bow of the launch, and experiments have been made in wireless signalling. Another improvement has been the adoption of compressed air for controlling the signalling system.

MAINE.

[GEO. D. COWIE.]

SUMMARY OF RESULTS.—Reconnoissance: 67 points revisited.

The revision of the triangulation on the coast of Maine southward from Passamaquoddy Bay was begun on July 14. Between that date and August 8, 67 points were visited and of these 60 were recovered, 3 were found to have been destroyed, and 4 were not located. In most cases the old stations were found without difficulty.

Aids to navigation were determined at Eastport, North Lubec, Pleasant Point, and Deer Island.

[O. B. FRENCH.]

SUMMARY OF RESULTS.—Reconnoissance: 15 square miles of area covered, 140 lines of intervisibility determined, 23 points selected for scheme. Triangulation: 15 square miles of area covered, 11 signal poles erected, 23 stations in main scheme occupied for horizontal measures, 43 geographic positions determined.

The revision of the triangulation of the coast of Maine in the vicinity of Eastport begun by G. D. Cowie was continued after August 11.

The work included the recovery of old triangulation stations, re-marking them where necessary, and such triangulation as was necessary to locate aids to navigation not previously determined.

All of the triangulation stations from the St. Croix River to Gouldsborough Bay were visited by Mr. French or Mr. Cowie, excepting a few near Calais which had recently been used in the triangulation along the boundary and had already been reported upon in connection with that work.

During the season of two months and three days 180 stations were visited, 123 of them recovered, and most of them re-marked. Six stations can not be located without additional triangulation. Only three stations were not found where marks in rock ledges were described. Forty-four stations were not found and are undoubtedly lost, of these 28 were simply marks on trees. Out of the remaining 16 only 2 had been marked in a permanent manner, the others being chimneys, church spires or stations where no marks were mentioned in the descriptions.

Twenty-three triangulation stations were occupied for the purpose of locating beacons or other objects, and the geographic positions of 43 points were determined.

[E. B. LATHAM.]

SUMMARY OF RESULTS.—Topography: 5 square miles of area revised, 8 miles of general coast line revised, 5 topographic sheets partly finished.

In the latter part of November the field revision of topographic work on the coast of Maine in the vicinity of Portland, which had been temporarily suspended in April owing to the necessity for work in another locality, was completed. The work done is included on topographic sheets 312, 414, 1188, 1224, and 1225.

MAINE, MASSACHUSETTS, AND RHODE ISLAND.

[ISAAC WINSTON.]

SUMMARY OF RESULTS.—Triangulation: 7 square miles of area covered, 73 stations recovered and re-marked, 7 stations in main scheme occupied for horizontal measures, 4 geographic positions determined.

During the autumn of 1913 a revision was made of the triangulation in the State of Maine along the Kennebec River from Augusta to a point about 8 miles south of Bath. A small sloop with auxiliary power was used for transportation.

All of the old stations in the vicinity of the river were searched for and nearly all of them were recovered. All recovered stations, 26 in number, were re-marked with standard station and reference marks. Three stations were found to have been destroyed.

Several tidal bench marks were recovered and levels were run between them. Several were found to have been destroyed.

Notes were made of numerous changes affecting the charts of the river and the necessary corrections were noted on copies of the charts.

The geographic positions of Ames Ledge Light and Abagadassit, Trout, and Rear Range Lights were determined.

Work was closed on November 14.

A revision of the triangulation in Narragansett Bay, Sakonnet River, Mount Hope Bay, R. I., and Taunton River to Taunton, Mass., was made between July 22 and September 16. A search was also made for tidal bench marks at Sakonnet Point, Warren, Bristol, Bristol Ferry, and Babbitts Wharf, Mount Hope Ferry, R. I.

Twenty-six stations were recovered and re-marked where necessary; 18 stations were found to have been destroyed and 3 stations not found are probably lost. Two tidal bench marks were recovered and re-marked, 1 was found of which the stability is doubtful, and 2 were found to have been destroyed.

Wharves were located at Tiverton, R. I., on both sides of the Sakonnet River and also the reservoir dam back of Easton's Beach near Newport.

Between July 21 and August 13 the work of recovering and re-marking triangulation stations in Rhode Island between Narragansett Bay and Fishers Island Sound was in progress. Twelve stations established by the Coast and Geodetic Survey and 36 stations established by the United States Engineers were recovered. The Coast and Geodetic Survey stations were marked with the standard station and reference markers and the United States Engineers stations with the authorized Engineers station markers and with the standard reference markers. The United States Engineers stations Cedars and Middle Bridge E were found to have been destroyed.

The geographic position of Green Hill Life-Saving Station was determined.

MAINE AND NEW HAMPSHIRE.

[ROSCOE P. STROUGH.]

SUMMARY OF RESULTS.—Hydrography: 10 square miles of area covered, 2102 miles run while sounding, 10,969 soundings made, 1 hydrographic sheet finished.

Work was begun in June 1913 on a hydrographic survey of Piscataqua River, Great Bay and the affluent streams.

The work was carried from the northwestern limit of the survey made by the Coast and Geodetic Survey in the Piscataqua River in 1903, $3\frac{1}{4}$ miles east-southeast of Dover Point, up the Piscataqua River to the junction of the Salmon Falls and Cocheco Rivers, and up the Salmon River to a distance of $1\frac{1}{2}$ miles above the highway and electric car bridge at South Berwick Junction. From the limits of the survey of 1903 the work was carried through Little Bay, up the Bellamy River to a junction with the hydrographic survey of that river made by the United States Army Engineers in 1909, up the Oyster River to the head of navigation, through Great Bay and up the Exeter River to about one-tenth mile north of the Stratham highway bridge, joining with the United States Engineers survey of 1909. The Cocheco and Lamprey Rivers were also surveyed by the United States Engineers in 1909.

The control of this work was obtained largely from the triangulation. Some of the topographic signals from the surveys of 1900, 1908, and 1909 were recovered and used, and some new signals were located with the plane table and sextant.

Lines of soundings were run generally in the direction of the channel at intervals of from 30 to 60 meters, according to depth, except on shoals where closer development was required. The soundings were referred to a tide staff at Dover Point.

MASSACHUSETTS.

[C. H. SINCLAIR.]

In the latter part of June a field revision was made of the chart of the vicinity of Cohasset, Mass., in order that recent changes, improvements, new structures, etc., might be put upon a new edition of the chart.

The positions of the aids to navigation were determined by theodolite or sextant angles. Four stations were occupied with the theodolite. This work was completed on June 24.

An inspection was made of the small observatory at Cambridge, Mass., with reference to its use in longitude determinations.

[J. H. HAWLEY.]

SUMMARY OF RESULTS.—Triangulation: 54 square miles of area covered, 1 signal pole erected, 3 geographic positions determined. Hydrography (wire drag): 4 square miles of area covered, 12.3 miles run while dragging, 89 angles measured, 7 soundings made, 1 tide station established, 1 hydrographic sheet begun.

In the latter part of May a wire-drag party was organized to continue work begun during the previous season in the approaches to the Cape Cod Canal in Buzzards Bay, Mass. The expected early opening of this important waterway made it desirable that all dangers in the channels leading to it should be accurately located.

Wire-drag work was begun on June 25. A drag about 2,400 feet in length was used. A tide staff was established at the mouth of Westport River and tide observations were begun on June 26. Several natural objects were located by triangulation to furnish control for the work.

MASSACHUSETTS, RHODE ISLAND, AND CONNECTICUT.

[W. E. PARKER.]

In September, in accordance with an arrangement with the Bureau of Lighthouses, apparatus for the observation of currents was installed on light vessels *No. 42*, Hen and Chickens; *No. 90*, Vineyard Sound; *No. 85*, Nantucket Shoals; *No. 41*, Hedge Fence; *No. 5*, Cross Rip; *No. 3*, Shovelful Shoal; relief *No. 66*, Boston; *No. 48*, Cornfield Point; *No. 13*, Bartlett Reef; *No. 23*, Ram Island Reef; *No. 39*, Brenton Reef; and *No. 74*, Cape Elizabeth.

The light vessels were visited in the order named, as the tenders were available for transportation. The lighthouse inspectors and officers of the vessels afforded every facility to the officer assigned to this duty.

On each light vessel where possible the instruments were adjusted and one observation made with the assistance of an officer of the vessel, and full instructions were given in regard to the observations required.

MASSACHUSETTS, NEW YORK, NEW HAMPSHIRE, AND VERMONT.

[FRANK NEUMANN.]

STATIONS OCCUPIED: *Massachusetts*: Becket and Pittsfield. *New Hampshire*: Winchester. *New York*: Alexandria Bay, Cape Vincent, Clayton, Camden, Morristown, Potsdam, Pulaski, and Rome. *Vermont*: Ludlow, South Londonberry, and Vergennes.

Magnetic observations were made at the above-named stations during the season from May 28 to June 30.

The stations on the St. Lawrence River were established as nearly as possible in the localities where observations had been made by the United States Lake survey observers in 1913. Stone or concrete posts and magnetic station markers were used to mark most of the stations.

A meridian line was established at Ludlow, Vt.

The stations at Camden, Clayton, and Morristown were not marked.

RHODE ISLAND, NEW YORK, AND DELAWARE.

[E. F. DICKINS.]

Inspection duty for the region included between Narragansett and Delaware Bays has been continued by an officer of the Survey with headquarters at the Customhouse, New York City.

The duties of the inspector are to obtain information for the correction of charts, reported dangers, notices to mariners, etc.; to furnish information in regard to charts, sailing directions, and tides; to supervise the construction and shipment of material needed for the repair or outfit of the vessels and boats of the survey, and to receive and forward instruments or material for the use of field parties and vessels; and to keep in touch with the maritime public and navigators and to find out their needs.

RHODE ISLAND AND NEW JERSEY.

[J. B. BOUTELLE, Commanding Steamer *Endeavor*.]

SUMMARY OF RESULTS.—Triangulation: 118 square miles of area covered, 85 signal poles erected, 29 stations occupied for horizontal measures, 100 geographic positions determined. Leveling: 6 elevations of tidal bench marks determined by leveling, 5 miles of levels run. Topography: Plane table triangulation for determination of hydrographic signals, new wharves, etc., only. Hydrography: 67.5 square miles of area sounded, 1,279.5 miles run while sounding, 6,102 positions determined, 59,734 soundings made, 4 tide stations established, 3 hydrographic sheets completed.

On July 1 the steamer *Endeavor* proceeded from New York to Narragansett Bay and began work on a sheet extending from Hope Island to the head of Greenwich Bay. On July 15 this work was temporarily interrupted in order to determine the position of buoys and of a reported rock off Great Point. This rock was located and also one in Sakonnet River, and the positions of the buoys were determined, and on July 24 the resurvey of Narragansett Bay was resumed.

Signals were erected over the area covered by three hydrographic sheets and determined by triangulation and by plane table and sounding was continued until November 1. The three sheets completed comprise the area on the west of Prudence Island from Hope Island northward to Bullock Point Lighthouse and including Greenwich Bay, and thence on the east side of Prudence Island and including Bristol Island to as far south as Dyer Island. Few changes were noticed from the general depths indicated on the charts. A number of uncharted rocks were located particularly off the north end of Patience Island.

On November 1 the vessel proceeded to Lewes, Del., and was engaged in examining the changes in Ricord and Cape May Channels. On November 21 the vessel proceeded to Baltimore for repairs.

From June 9 to 30 the steamer *Endeavor* was engaged in hydrographic work in the vicinity of Cape May, N. J. Signals were erected and determined in position by triangulation. Sounding was commenced on June 18 and was in progress at the end of the month.

NEW YORK.

[E. B. LATHAM.]

SUMMARY OF RESULTS.—Topography: 14 square miles of area surveyed, 53.5 miles of shore line surveyed, 2.5 miles of rail and electric roads surveyed, 4.75 miles of roads surveyed, 1 topographic sheet begun, scale 1/10,000.

A topographic resurvey of Jamaica Bay, south shore of Long Island, N. Y., on a scale of 1/10,000, was begun on May 15 and was in progress at the close of the fiscal year. By the end of June, 14 square miles of area had been covered and 53.5 miles of shore line run.

CONNECTICUT, NEW YORK, AND NEW JERSEY.

[H. C. GRAVES, Commanding Steamer *Hydrographer*.]

SUMMARY OF RESULTS.—Hydrography: 1.5 square miles of area covered, 80 miles run while sounding, 1,501 soundings made, 1 hydrographic sheet finished, 23 uncharted rocks located, 6 other objects for correction of charts located.

Under instructions dated July 1 the steamer *Hydrographer* left Baltimore on July 21 and proceeded by way of the Chesapeake and

Delaware Canal to Cold Spring Inlet at Cape May, N. J., arriving there on July 22.

At Cape May an examination was made, changes in channels and shoals were reported, and information was obtained in regard to the inland waterways on the coast of New Jersey. On July 24 the vessel proceeded to Jersey City.

From July 24 until October 23 the party on the *Hydrographer* was employed on the field of work covering all navigable waters and tributaries in the vicinity of Block Island Sound, Gardiner's Bay, Hudson River to Troy, and New York Bay. The navigable waters and inside route on the south coast of Long Island from Peconic Bays to Far Rockaway Inlet were examined.

Twenty-three uncharted rocks were located, and six other chart corrections were reported, and hydrographic surveys were made of Great Salt Pond, Block Island North Reef, and for a reported shoal at Whitestone Point, East River.

Twenty swings of the ship, each on 32 headings, were made to determine compass variation.

NEW YORK.

[H. C. DENSON.]

SUMMARY OF RESULTS.—Triangulation: 70 square miles of area covered, 9 signal poles erected, 8 stations in main scheme occupied for horizontal measures, 40 geographic positions determined. Leveling: 3 permanent bench marks established, 2 miles of levels run. Topography: 18½ square miles of area surveyed.

Chart revision work on the south shore of Long Island in the vicinity of Great South Bay was begun in May. The object of this work was to bring the charts of this region up to date to meet the requirements of the numerous motor boats and other small craft navigating these waters. No considerable changes were found to have taken place in the natural features of the shore line, but the great number of improvements that have been made, such as bulkheads, yacht basins, navigable canals, and numerous new roadways leading to the shore necessitates what is almost an entirely new survey of the area shown on the old charts.

By June 30 the topography had progressed from the western edge of the town of Babylon to Great River, a distance of 11 miles, in a direct line to the eastward and extending back from the shore as far as the main highway running east and west on Long Island. The work completed on the outer beach includes Muncie Island, Oak Island Beach, Point of Woods, and Ocean Beach.

The triangulation was begun at the base Nichol to Island and was carried as far as Howell's Point, a distance of 13 miles.

In the execution of this work permanent objects such as standpipes, watertanks, cupolas of buildings, and factory chimneys were carefully determined for use in hydrography.

A reconnoissance of the area to be surveyed indicates few changes in depths from those shown on the chart, except in the vicinity of Fire Island Inlet, and where dredging has been done in the channels leading from the main shore to the resorts on the outer beach.

NEW JERSEY.

[STEHMAN FORNEY.]

SUMMARY OF RESULTS.—Reconnaissance: 9 square miles of area covered, 225 lines of intervisibility determined as per sketch submitted, 54 points selected for scheme. Base lines: 7 tertiary. Triangulation (tertiary): 14.5 square miles of area covered, 68 signal poles erected, 104 stations in main scheme occupied for horizontal measures, 204 geographic positions determined. Topography: 32.85 square miles of area covered, 56.95 miles of shore line of rivers surveyed, 24.5 miles of shore line of creeks, 91 miles of shore line of ponds surveyed, $3\frac{1}{2}$ miles of shore line of canals, 96 miles of railroads, 4 topographic sheets finished. Hydrography: 1 square mile of area sounded, 11 miles run while sounding, 130 positions determined, 215 soundings, 2 tide stations occupied, 1 hydrographic sheet finished.

From July 1 to September 30 work was continued on the triangulation of Newark Bay up to the mouths of the Hackensack and Passaic Rivers and the topography and shore line of Newark Bay into the mouths of the same rivers.

At Bergen Point, where the refining plant of the Texas Oil Co. is located, there is a dredged channel which was made by that company in order to permit their large seagoing tank steamers to come to the wharves. This channel was thoroughly sounded out and developed. No other hydrographic work was done on Newark Bay or the Hackensack and Passaic Rivers, as the depths in these localities do not appear to have changed to any extent since the dredging in 1906-1913 and the surveys by the United States Army Engineers in 1906.

The triangulation was extended up Newark Bay from the line Bergen Point Lighthouse to Summerville Methodist Church spire, stations in the triangulation of the United States Army Engineers. All church spires, factory chimney stacks, and other prominent objects visible from the bay and rivers were determined in position.

In October the triangulation was completed up the Hackensack River to Smoke Hill and up the Passaic River to the Erie bridge in Passaic City. The topographic sheet on a scale of 1/10,000 of Newark Bay, up the Passaic River to the Plank Road Bridge in Newark, and up the Hackensack River to the Jersey City end of the same bridge was also completed.

An entirely new scheme of triangulation was necessary for Newark Bay and its tributaries. None of the original stations were recovered, many of them having been obliterated by the erection of buildings and others by the erosion of the shores. In the triangulation of the Passaic River stations were established on the tops of flat-roofed buildings and marked with the usual bronze disks set in cement blocks. The lines are short and the stations numerous, but an unbroken scheme of quadrilaterals was developed from Smoke Hill on the Hackensack and up the Passaic River to the first dam above Passaic River.

The shores of Newark Bay and its tributaries have undergone marked changes in the way of improvements along the water front; many new buildings, wharves, and structures have been built, and many of the old structures have been removed or destroyed.

An extensive sewer system is under construction at Newark, which when completed will greatly improve the sanitary conditions along

the Passaic River. The solid portion of the sewage will go to a disposal plant on the Newark flats and the purified liquid residue will flow into Newark Bay.

Between January 1 and March 22 the party was engaged in the tertiary triangulation of the Passaic River northward from the Erie Railway bridge at Arlington, N. J., and the topographic survey of the Hackensack River from its mouth northward to the West Public Service Building, and of the Passaic River from the Plank Road Bridge to the Pennsylvania Railway passenger bridge, including a great deal of detail in the way of docks, bridges, streets, trolley and railway tracks. In this work local and railroad maps were utilized for details.

Between March 23 and May 3 the party was temporarily under charge of E. B. Latham. During this period 7 tertiary base lines were measured on the county and railroad bridges crossing the Passaic River, and two plane-table sheets were partly completed, and tracing made from local surveys.

From May 4 to the close of the fiscal year the triangulation and topographic resurvey of the Passaic northward from the Erie Railway bridge at Arlington, N. J., was continued. The triangulation was completed to the first dam above Passaic, and the topography to triangulation stations Coal and Brush.

[E. B. LATHAM.]

SUMMARY OF RESULTS.—Base lines: 6 tertiary, total length 2,100 meters. Topography: 7.5 square miles of area surveyed, 13 miles of rivers surveyed, 23.5 miles of roads surveyed, 2 topographic sheets partly finished.

Between March 27 and May 4 the resurvey of the Passaic River was temporarily in charge of E. B. Latham. The plane-table work was continued. Streets near the water front were plotted from published maps and controlled by points determined in the field. Six lines in the triangulation of the Passaic River from 108 to 1,200 meters in length were measured with a tape and base apparatus. One topographic sheet of Passaic River, south of the Erie Railroad bridge, on a scale of 1:5,000, was practically completed and another sheet north of the Erie bridge was one-quarter completed.

[PAUL C. WHITNEY, Commanding Steamer *Hydrographer*.]

SUMMARY OF RESULTS.—Hydrography: 6 square miles of area covered, 32.25 miles run while sounding, 262 angles measured, 651 soundings made, 1 tide station established, 1 hydrographic sheet finished.

In the early part of June the following work was done:

Topographic examination of a section of the water front of Elizabethport, N. J., to locate an error in a previous survey; location of buoys in the lower anchorage, New York Bay; location of life-saving stations along the coast of New Jersey; search for shoal spot reported 1 mile southeast of Fort Hamilton, N. Y. This report was found to be erroneous.

On June 22 the *Hydrographer* began operations in Long Island Sound, in vicinity of Stamford. This work consists of what is practically a resurvey of the water areas of the Sound from Execution Rocks eastward to the Norwalk Islands.

DELAWARE.

[PAUL C. WHITNEY.]

SUMMARY OF RESULTS.—Leveling: 2.6 miles of levels run to connect tidal bench marks. Hydrography: 9 square miles of area covered, 117.8 miles run while sounding, 3,889 soundings made, 1 tide station established, 1 hydrographic sheet finished.

Between July 31 and August 14 a hydrographic survey on a scale of 1:10,000 was made of the inner and outer harbors of Delaware Breakwater. Natural objects previously determined were used for signals. All existing tidal bench marks in the vicinity were connected by leveling and a tide staff used in this survey was referred to these bench marks. The nonexistence of the back range for compass deviation work was reported on.

NEW JERSEY, DELAWARE, MARYLAND, AND VIRGINIA.

[L. A. POTTER.]

Field revision of the region included in Coast Pilot, Section "C," which includes the coast from Sandy Hook to Cape Henry, with Delaware and Chesapeake Bays and their chief tributaries, was begun March 16. The navigable waters were visited by using the regular steamer lines or by hired launches. The work on the Potomac River and tributaries was completed on March 30.

On May 11, revision work was taken up at Milton, Del. From this date until May 23 an examination was made of the interior channels and inlets on the coast between Cape Henlopen and Cape Charles. On May 16, $2\frac{1}{2}$ miles of shore line was relocated at Assateague anchorage, where extensive changes have occurred. On May 19 and 20, $2\frac{1}{2}$ miles of shore line was relocated at Wachapreague and Great Machipongo Inlets.

Between May 23 and June 23 the navigable waters on the eastern shore of Chesapeake Bay from Cape Charles northward, to and including the Choptank River, were examined.

Throughout the progress of the work opportunity was taken wherever possible to take sextant angles for the location of aids to navigation.

NEW JERSEY, DELAWARE, PENNSYLVANIA, VIRGINIA, AND NORTH CAROLINA.

[J. R. BENTON.]

STATIONS OCCUPIED.—*New Jersey*: Beverly, Bordentown, Haddonfield, Hightstown, Lambertville, Merchantville, and Trenton. *Delaware*: Bellevue, Felton, and Wilmington. *Virginia*: Cape Charles. *North Carolina*: Scotland Neck.

The stations in the foregoing list were occupied for magnetic observations by the observer named between July 1 and August 16. Of these Cape Charles was an old station which was reoccupied and the others were new stations. The new stations were permanently marked usually with a terra cotta drainpipe set in cement and capped with a bronze station mark.

In the region around Bellevue, Del., the magnetic declination was found to be more than 12 degrees west of north, the normal variation for that locality being only about $7\frac{1}{2}$ degrees; and to determine the extent of this irregularity observations were made at 26 additional places in Delaware and Pennsylvania for a distance of about 22 miles east and west and about 13 miles north and south of Bellevue.

It was found that the declination varied in the region covered between extremes of 3 degrees and 21 minutes west at Montchanin, Del., and 12 degrees and 12 minutes west at Bellevue, Del. The dip varied between 71 degrees at Talleys Corner, Del., and 73 degrees and 30 minutes at Concord, Del. The horizontal intensity also varied between .1770 Gauss at Concord, Del., and .2014 Gauss at Hockessin, Del.

The distribution of the magnetic disturbance in this region appears to be quite irregular although the westerly declination seems to increase at points on the eastern side of the disturbed area and to decrease at points on the westward side. The irregularity appears to extend beyond the area over which observations were made, but is greater on the west side of the Delaware River where the country is hilly and rocky.

Between June 20 and June 30 magnetic observations were made at Wilmington, Del.; Bordentown, Hightstown, Lambertville, and Trenton, N. J. At all of these places, except Wilmington, the old stations were reoccupied. At Wilmington observations were made as nearly as possible in the position of the original station, but no mark was left as the ground was being regraded. The other stations were permanently re-marked.

MARYLAND.

[GEORGE HARTNELL.]

The regular work of the magnetic observatory at Cheltenham, Md., has been continued during the year. All of the observatory instruments have been in satisfactory adjustment.

Comparisons were made with the standard observatory instruments of a magnetometer and earth inductor belonging to the Carnegie Institution.

In the latter part of the year a number of adjustments to the magnetographs were found necessary, but this did not prevent obtaining complete records of the magnetic elements.

A new azimuth mark was placed and satisfactory observations for azimuth were made.

The observatory buildings are in good condition.

VIRGINIA.

[O. W. FERGUSON, Commanding Schooner *Matchless*.]

SUMMARY OF RESULTS.—Reconnoissance: Length of scheme 45 miles. Base lines: 1 secondary, 429 meters in length. Triangulation: 107 square miles of area covered, 175 signal poles erected, 27 observing tripods and scaffolds built (average height 25 feet), 32 stations in main scheme occupied for horizontal measures, 12 stations in supplemental scheme occupied for horizontal measures, 22 geographic positions determined. Leveling: 13 permanent bench marks established, 8 miles of levels run. Topography: 2.8 square miles of area surveyed, 86 miles of general coast line surveyed, 3 miles of creeks surveyed, 7 miles of roads surveyed, 3 topographic sheets finished. Hydrography: 165 square miles of area covered, 1,376.7 miles run while sounding, 6,291 angles measured, 47,310 soundings made, 6 tide stations established, 2 current stations occupied, 5 hydrographic sheets finished.

At the beginning of the fiscal year the schooner *Matchless*, which had previously been engaged on the survey of the eastern branch of Elizabeth River, Va., was at Baltimore undergoing repairs.

The survey of the eastern branch of Elizabeth River was resumed on September 12, and continued to completion on September 21. The triangulation started from stations Berkley and Power. In this work six station marks established by the United States Engineers were utilized and another was determined. Other triangulation points occupied and reference points were marked in the usual manner. In September the line between Broad and Park triangulation stations was remeasured twice with a steel tape and satisfactory results were obtained.

The topographic work executed on a scale of 1:5,600 was all in the vicinity of Norfolk. The details were mapped for a distance of 200 to 300 meters from the river, joining with the survey of the southern branch.

The hydrography was continued to the head waters of the branches. Sounding lines were run only in the direction of the stream. The western limit of the hydrography is Campostella Bridge, the area to the westward having been covered by the United States Engineers.

Current observations were made on two days in the channel below the Norfolk & Western Railroad bridge.

Observations of high and low waters, night and day, were made during the progress of the work at a gauge established at Berkley.

Between September 12 and 15 lines of level were run in Richmond, Va., connecting two tidal bench marks with permanent bench marks.

On September 20 the work in Elizabeth River was finished and surveys were begun on the eastern shore of Virginia in the vicinity of Cape Charles. The inshore hydrography from 3 miles below Fishermans Island at the entrance to the Chesapeake Bay to 25 miles above, with a usual width of hydrography of 3 miles, was in progress during the period from September 23 to December 31.

Twelve old triangulation stations were recovered from which a supplemental scheme of triangulation was extended to furnish points for the control of the hydrography. The line Old Plantation Flats Lighthouse to Cherrystone Lighthouse was used as a base.

The positions of lightship *No. 35* on the Middle Ground and of other aids to navigation were determined.

Tide observations were made at Cape Charles City during the progress of the hydrography in that vicinity and a comparison was made of the results with those obtained at the quarantine station at Fishermans Island.

The work done by this party from January 1 to June 30 begins 3 miles below Fishermans Island, covers 45 miles of the eastern shore of Chesapeake Bay, and includes many creeks.

This area is covered by three large sheets on a scale of 1:20,000. The more detailed work is shown on a hydrographic sheet and a topographic sheet for the entrance to Cape Charles City and for Cape Charles City itself on a scale of 1:5,000.

For the control of the topography and hydrography 25 old triangulation stations were recovered, and a sufficient number of additional points were located either by triangulation, with the plane-table, or by traverse lines.

All old stations recovered were permanently marked.

The shore line of Nassawaddox Creek was rerun, and such other topographic work was done as was required to show changes in the shore line.

The principal work done was the hydrography of the creeks and from the shore to a depth of 6 or 7 fathoms, with lines sufficiently close to develop all of the shoal area, bars, and channels.

Tide gauges were established at the quarantine station on Fishermans Island, at Old Plantation Flats Lighthouse, at Cape Charles City, and on Nassawaddox Creek and Nandua Creek.

[W. C. HODGKINS, Commanding Steamer *Bache*.]

SUMMARY OF RESULTS.—Triangulation: 3 stations occupied for horizontal measures. Magnetic work: Ship swung at 1 station for magnetic deviation. Hydrography: 66 square miles of area covered, 644 miles run while sounding. 14,619 soundings made, 1 tide station established.

After completing repairs at Boston the steamer *Bache* sailed from that port on August 5 and arrived in Chesapeake Bay on August 8. From that date a careful development was begun of a comparatively shoal bank northward of the main ship channel close to Cape Henry at the entrance to Chesapeake Bay for the purpose of ascertaining the deepest draft that can be safely taken over the bank.

A tide gauge was established at the wharf of the Cape Charles quarantine station on Fishermans Island. The tide staff was connected by leveling with the bench marks at that station and with several additional bench marks established for the purpose.

On account of the difficulty of fixing positions, due to the width of the entrance and to the frequently hazy condition of the air, a water signal was built on the Middle Ground shoal. Bad weather and rough water retarded the erection of this signal.

On August 3 the vessel was visited by the Assistant Secretary of Commerce and the Superintendent of the Coast and Geodetic Survey who came on board at Hampton Roads to inspect the work at the entrance to the bay.

The hydrography of the entrance was advanced as rapidly as conditions would permit. The water signal which had been built with considerable trouble and expense was destroyed by a severe storm in the latter part of September and was not reerected.

By the latter part of October the area included between the parallels $36^{\circ} 57'$ and $37^{\circ} 03'$ and by the meridians $75^{\circ} 49'$ and $76^{\circ} 00'$, had been sufficiently examined, and work was closed for the season on October 28.

After closing this work an examination was made of a rock in the Georgetown Channel, Potomac River, opposite Easbys point, which had been reported as a danger to navigation.

NORTH CAROLINA.

[R. P. STROUGH.]

SUMMARY OF RESULTS: Base lines: 3 secondary, 852, 539, and 1,025 meters in length. Triangulation: 670 square miles of area covered, 108 signal poles erected, 3 observing tripods and scaffolds built, average height 40 feet, 104 stations in main scheme occupied for horizontal measures, 115 geographic positions determined. Azimuth: 1 azimuth station occupied.

Work was begun January 14 on the triangulation of the coast of North Carolina in the vicinity of Swansboro. Four triangulation stations established in 1909, just east of Bogue Inlet, were recovered and a base line about one-half mile in length was measured between

two of them. The geographic positions throughout the scheme depend upon that of station Bell at the southwest extremity of the base. After the measurement of the base signal building and observing were carried on when the weather permitted until about the middle of February, by which time work was completed as far as Freemans Landing, about 10 miles southwest of White Oak River. From here nearly to New River the sound is about one-third mile in width and it was necessary to narrow the scheme to this width. Along the shore of the mainland the high trees come down nearly to the beach and a broadening of the scheme by the use of high poles and scaffolds was impracticable. Many stations were necessary. A base was measured in this narrow portion of the work about 3 miles northeast of New River. The measurement of this base agreed with the computed length within about 1 part in 15,000. From this base toward New River the scheme is narrow for about 2 miles and then broadens considerably at the mouth of New River and continues with a width of over a mile from New River to the southwest for about 12 miles where it narrows slightly and then broadens out to $1\frac{1}{2}$ or 2 miles in width at Topsail Sound.

Connection was made with six triangulation stations established in 1855, and the lengths of the lines between them were found to agree satisfactorily with the new work. Three stations of the United States Army Engineers at the mouth of New River were recovered and connected with the triangulation. Two of these stations were re-marked.

About April 1 work was begun in Stump Sound and continued through Stump and Topsail Sounds to Bald Eagle Point abreast of Rich Inlet. Many of the old stations along this portion of the coast were searched for but none were found. All the new stations were marked with the standard disc station and reference marks. On May 20 the charge of the work was transferred to C. L. Garner.

[C. L. GARNER.]

SUMMARY OF RESULTS.—10 square miles of area covered, 9 signal poles erected, 13 stations in main scheme occupied for horizontal measures, 19 geographic positions.

The triangulation done by R. P. Strough between Beaufort and Rich Inlet was extended to Wrightsville, N. C., by C. L. Garner between May 23 and June 12, when work was closed for the season.

Work was begun on the line Eden to Rich, of which station Rich had not been occupied, and carried to about 1 mile east of Wrightsville Beach, finishing with a completed quadrilateral. Stations of the former triangulation were searched for but none were found.

SUMMARY OF RESULTS.—Base lines: 1, 2,238 meters in length. Triangulation: 210 square miles of area covered, 44 signal poles erected, 7 observing tripods and scaffolds built, heights from 10 to 45 feet, 40 stations in main scheme occupied for horizontal measures, 75 geographic positions determined. Leveling: 1.3 miles of levels run. Topography: 14 square miles of area surveyed, 83 miles of shore line of rivers surveyed, 1.7 miles of creeks surveyed, 2.7 miles of roads surveyed, 2 topographic sheets finished.

Between December 30 and May 18 work of triangulation and topography was done in Albemarle Sound and vicinity.

After building the necessary signals observations in the triangulation across Albemarle Sound were begun on January 16 and con-

tinued until February 9, when on account of unfavorable weather observations were suspended on the sound and work begun on Alligator River, where the weather conditions had less effect on progress.

The triangulation was carried up the river to above Deep Point, where the stream narrows to about one-half mile in width, and was closed on March 8. The triangulation on Albemarle Sound was then resumed and afterwards that on the Pasquotank River.

During the observations across Albemarle Sound large signal lamps were used and observations were made at night.

The topography in the Alligator River, begun March 27, was carried up the river to the end of the triangulation and finished by April 21. The shore line was found to have receded along practically the entire river, in several places as much as 200 meters.

On April 22 the triangulation in North River was taken up and continued to beacon No. 10, south of Buck Island. Here it joins with the triangulation by the United States Army Engineers, which extends to the mouth of the Albemarle and Chesapeake Canal.

A base 2,200 meters in length was measured just to the southward of Buck Island.

Permanent reference marks were established at each station in the triangulation consisting of a brass plate set in concrete, and distinctive marks were also cut in trees. The marks were often placed at a considerable distance from the shore, in order that some mark may be recovered even if the station, which is usually close to the shore, should be lost.

NORTH CAROLINA AND SOUTH CAROLINA.

[ISAAC WINSTON.]

SUMMARY OF RESULTS.—Triangulation: 11 square miles of area covered, 2 observing tripods and scaffolds built 25 feet in height, 8 stations occupied for horizontal measures, 3 geographic positions determined.

In March the work was begun of determining by triangulation the geographic positions of three beacons in the mouth of North Edisto River, S. C., erected in 1913 for the use of the Bureau of Lighthouses. Scaffolds and signals 25 feet in height were constructed at each of these beacons and at two old triangulation stations and a pole was erected on the roof of the Rockville church, the steeple of which had been destroyed. A search was made for triangulation stations "Haul-over" and "Burrill," but these were found to have been destroyed, nor could many other of the old stations be found. Five lines were found to be obstructed by high trees and on two of them heavy cutting was necessary.

The old stations "East Base," "First Mile Stone," "Second Mile Stone," and "Seabrook Island" were used, and four new stations were established.

The geographic positions of the three beacons were determined.

Preparations were made in the latter part of May for completing a tertiary triangulation of the Cape Fear River from the work by the Coast and Geodetic Survey in 1913 up to Wilmington, to include connection with the old stations of the Coast and Geodetic Survey and with the triangulation of the United States Engineers, and also a determination of the geographic positions of all lights and day marks established by the Bureau of Lighthouses.

Information relating to the triangulation by the United States Engineers was obtained from their office at Wilmington, N. C., and all arrangements for the work were completed, when the observer was instructed to suspend operations and proceed to the coast of South Carolina.

On June 7 work was begun on the erection of 7 large hydrographic signals for the use of the party on the steamer *Bache* on the coast of South Carolina, in vicinity of Cape Romain. This work was in progress at the close of the fiscal year. Observations on known positions were made from the signals, and from Cape Romain and Georgetown Lighthouses such signals as were visible were observed upon.

NORTH CAROLINA.

[P. C. WHITNEY, Commanding Steamer *Hydrographer*.]

SUMMARY OF RESULTS.—Reconnoissance: Length of scheme 75 miles, 200 square miles of area covered. Triangulation: 200 square miles of area covered, 77 signal poles erected, 3 observing scaffolds and tripods built, height 30 feet, 67 stations in main scheme occupied for horizontal measures, 14 stations in supplemental schemes occupied for horizontal measures, 137 geographic positions determined. Topography: 3 square miles of area surveyed, 10½ miles of shore line of rivers surveyed, 12½ miles of roads surveyed, 1 topographic sheet finished. Hydrography: 9 square miles of area sounded, 253.2 miles run while sounding, 14,165 soundings, 2 tide stations established, 7 hydrographic sheets finished.

From December 22 to May 6 the *Hydrographer* was engaged in the survey of the Pamlico River, N. C.

A new scheme of triangulation was run from stations of the Coast and Geodetic Survey triangulation which had previously been established by Assistant J. W. Maupin, up the Pamlico River to Washington, N. C., and a scheme was carried up the Pungo River to Leechville from a line of the Pamlico River work. Especial effort was made to recover stations of the old triangulation of 1871-1873, but only one was found, Cedar Grove near Washington.

The work was connected with the triangulation of the United States Engineers from Washington to a point 10 miles below. Nearly all of the stations of the United States Engineers were recovered. All lights and other objects of importance to navigators and others were determined in position, both in the Pamlico and Pungo Rivers. At the request of the United States Engineers a scheme of triangulation was carried up Slades Creek. No old stations were found in the Pungo River.

All main scheme stations were permanently marked and reference points were established.

The hydrography consisted in the development of certain spots, points of shoals, etc. A complete development of Pamlico River outside of the dredged cut and above Fort Point was made to show the limits of the dumping grounds on which the material from the cuts had been deposited. In several these are bare at low water. A shoal carrying 5½ feet near Fort Point was located and another off the mouth of Broad Creek. All buoys were located.

To show the improvements along the water front of Washington and vicinity a topographic survey on a scale of 1:5,000 was made.

Assistance was rendered the U. S. Torpedoboat *Foote* by pulling her off a reef upon which she had dragged in a gale in the harbor of

Washington, N. C. At the request of the commander of the United States Naval Battalion, an officer of the *Hydrographer* was detached to navigate the *Foote* from Elizabeth City to Washington. Aid was rendered the keeper of the United States lighthouse depot at Washington in relighting and repairing beacons. A launch and the services of several men were temporarily placed at his disposal for this purpose.

NORTH CAROLINA AND SOUTH CAROLINA.

[J. B. BOUTELLE.]

SUMMARY OF RESULTS.—Triangulation: 35 square miles of area covered, 9 stations occupied for horizontal measures, 6 geographic positions determined. Topography (shore line only): 30 miles of general coast line surveyed, 2 topographic sheets finished. Hydrography: 47 square miles of area covered, 634 miles run while sounding, 4,215 positions determined, 26,266 soundings made, 3 hydrographic sheets finished.

The party on the steamer *Endeavor* began hydrographic work in St. Helena Sound, S. C., on February 4. A number of old triangulation stations were recovered, signals were erected and determined in position by triangulation, and the sounding and topography of the shore-line changes was begun and continued until April 18. The shore line on the south and east sides of Otter Island at the mouth of the Ashepoo River and at the northeast end of Hunting Island was found to have changed considerably. Between the mouth of Johnsons Creek and Harbor River a long point covering considerable area has built out extending up the channel of Harbor River south of Egg Bank. The northeast end of Hunting Island has been cut away for about three-tenths mile from a point about one-half mile south of Hunting Island Lighthouse. These changes have caused corresponding changes in the hydrography, new channels and shoals having formed on this area. The entrance to Harbor River is nearly closed up by new shoals with narrow channels between them with depths ranging from about 8 to 14 feet. With an easterly swell the sea breaks all over this area and it is unsafe for any but light-draft boats with a pilot or with local knowledge to attempt to enter Harbor River from the sea. There is a good channel with a least depth of 8 feet on the western side of Egg Bank extending from Morgan to Harbor River, and this is used by all local boats. It has recently been marked by four day marks, consisting of a large pile and target. A new channel has cut through Pelican Bank about north from Egg Bank, from the main channel of the sound into Morgan River. It has a least depth of 8 feet and is about 500 feet wide.

Considerable change was found over the area on the south and west side of Ashepoo River, known as Combahee Bank. The beacon which was formerly on the point of the shoal is now in 4 fathoms of water. The two long shoals on either side of the main channel of St. Helena Sound which were reported to have moved one-half mile southwest were found to be in practically the same position as charted. The main channel was sounded from the mouth of the Coosaw River to the bell buoy outside the bar, the work extending as close as possible to the shoals on either side.

On April 20 the party proceeded to Cape Fear and surveyed the Slue Channel around the end of the cape, the eastern side of the

Middle Ground and channel at entrance to Cape Fear River, and made a plane-table survey of the shore line from Bald Head around the cape and thence to Carolina Shoal Beach. Extensive changes were found here, the cape having been cut away for about one-half mile and a new slue channel formed. This channel has a least depth of 13 feet and is about 400 feet wide with two turns. It has been used for several years by the fishing steamers drawing 9 to 10 feet, and the Beaufort, N. C., pilots take yachts through to avoid the long trip around Frying Pan Shoals. The slue has been recently buoyed, but owing to the very strong currents and to the sea breaking heavily here with an easterly swell the buoys are liable to drag out of position. The shore line from the cape to the Carolina Shoal Beach also shows extensive changes, and the two inlets, Corncake and New Inlet, have both moved to the north.

FLORIDA.

[N. H. HECK.]

SUMMARY OF RESULTS.—Triangulation: 3 square miles of area covered, 3 stations occupied for horizontal measures, 1 geographic position determined. Topography: 0.3 square mile of area covered. Hydrography: 29 square miles of area dragged, 0.1 square mile of area sounded, 102.2 miles run while dragging, 2.8 miles run while sounding, 6,166 positions determined, 511 soundings made, 4 hydrographic sheets finished.

Work of examining with the wire drag the approaches to the harbor of Key West was resumed early in January.

The instructions for the season's work included the development of a shoal ridge outside of the outer reef, a complete examination of the Northwest Channel, the dragging of areas previously omitted and the examination of the result of operations by the Corps of Engineers, United States Army, in improving the main ship channel to a least depth of 30 feet mean low water over a width not less than 300 feet.

The first work taken up was that in the main ship channel. The removal of a portion of the Western Triangle shoals was completed by the United States Engineers, and with the cooperation of the Bureau of Lighthouses buoy C3 was removed and then replaced in a position to indicate the full width of the channel as improved. The northeast part of Western Head, charted at 22 feet, was completely removed by the Engineers to a depth greater than 30 feet. Several additional shoals were buoyed for the use of the United States Engineers in locating them for removal. In the channel through the outer reef the project of the United States Engineers included a 300-foot channel 30 feet deep at mean low water, 15 feet on each side of the entrance range. In order to make an immediately available deep channel the engineer first removed the 24-foot shoal eastward of the range. The method of removal was to blast near the deep water first, so that the material might be removed by gravity assisted by the action of the current on the finer material resulting from the explosion. This operation was found to be partly successful, but the survey indicates that the available depth of the channel is no greater than before, as lumps remain over which the depth has not been increased. The engineer was supplied with the necessary information for completing the channel to the required depth.

The weather during the season was generally favorable for the examination of the outer reef. As a result the indicated outer ridge was almost completely developed from Pelican Shoal to Vestal Shoal. The depths over the ridge are greater than 40 feet except in certain places. Ridges lying off Sand Key and Southeast Channel entrance were previously examined and developed as follows:

Off Vestal Shoal, Satan Shoal, and Western Dry Docks, western extension of ridge off Southeast Channel, two parallel ridges off Middle Sambo Shoal. Depths were found generally from 30 to 39 feet, the former depth occurring in a number of places.

At the close of the season on March 31 the dragging of the Northwest Channel was completed except in a few small areas, and over the greater part of it the effective depth was only 15 feet. This depth is fixed as a maximum by the presence of two uncharted shoals. A special effort was made to leave no area unfinished on which there is a depth of less than 17 feet.

Areas left unfinished in previous work were dragged as opportunity offered, those nearest Key West being first taken up. Some special soundings were taken in the boat harbor at Key West.

The new position of the Northwest Beacon Light was determined by triangulation. Some chart revision work was done to show a new wharf and changes in the railway terminal.

All bench marks at Key West and the staff of the automatic tide gauge were corrected by leveling.

A number of improvements were made in the methods of recording and plotting the wire drag work. The description of the long wire drag was revised for publication.

FLORIDA, ALABAMA, MISSISSIPPI, AND LOUISIANA.

[W. E. PARKER.]

In the latter part of April work was begun on examination of certain inland waters along the Gulf coast east of the Mississippi not included in the examination of the previous year or requiring reexamination on account of reported changes. From Fort Myers, Fla., a trip was made down the Caloosahatchee River and into Pine Island Sound and another trip up that river and into Lake Okechobee. At Tampa, Fla., information was obtained from the office of the United States Engineers in regard to the canal under construction between Boca Ceiga Bay and Clearwater Harbor. A reexamination was made of Anclote River to determine the positions of new lights which were reported to have been established.

From Carrabelle, Fla., an examination was made of Crooked and Ocklocknee rivers and Ocklocknee Bay. Information was obtained from the Florida State drainage engineer regarding the extension of the State drainage canals from Lake Okechobee to the Atlantic. The eastern part of the canal from Apalachicola River to St. Andrews Bay was reached by hired launch from Apalachicola and the western part by launch from Panama City on St. Andrews Bay. All of the branches of St. Andrews Bay were examined. From Panama City the route was to Pensacola and from there to Perdido Bay, where an examination was made of the bay and entrance.

The Mississippi River from New Orleans to the Gulf, Lakes Borgne and Pontchartrain and all of the navigable passages on the

eastern side of the Mississippi for which complete information was lacking were examined.

A careful examination was made of improvements recently completed at Eau Gallie, Fla.

All field work was completed by June 6.

FLORIDA AND TEXAS.

[CHARLES C. YATES, Commanding Steamer *Bache*.]

SUMMARY OF RESULTS.—Hydrography: 240 square miles of area covered, 1,188 miles run while sounding, 6,677 soundings made, 800 miles run with submarine sentry, 609 positions determined, 121 lines of astronomical positions observed, 1 tide station established, 2 hydrographic sheets finished.

On April 29 the steamer *Bache* began a survey of that portion of Sabine Bank in the vicinity of Sabine Bank Lighthouse, the object of the work being to investigate the existence of shoals on which several ships were supposed to have grounded in 15 or 25 feet, and reported as being three-fourths to 1½ miles from the lighthouse.

The results of this survey showed that the existing charts of the locality are less in error than appeared from the reports of the shipmasters, and indicate that the vessels had probably grounded much nearer to the light than reported.

The survey made will furnish all information necessary for the correction of the charts so that similar accidents will not occur in the future. The removal of the buoy located on the eastern side of the channel to the western side on the shoalest point making out to the eastward from the light was recommended.

On the voyage from Key West to Sabine Bank and in returning a survey was made to develop a 10-fathom shoal reported by fishermen where the charts show depth of 25 to 35 fathoms, situated about 100 miles northwest of Tampa. During the first part of the search for this shoal the ground was covered rapidly by going full speed with a submarine sentry set at 20 fathoms and by soundings taken every half hour. For three nights and days this method gave no indication of the shoal, but on the last day the sentry struck bottom and a sounding of 17 fathoms was obtained where the chart showed more than 25 fathoms.

On the return voyage the search was continued by taking soundings every five minutes but no depth was found of less than 14 fathoms. The bottom is very rocky and consecutive soundings showed abrupt changes of 5 to 7 fathoms.

ALABAMA, FLORIDA, GEORGIA, AND MISSISSIPPI.

[WALLACE M. HILL.]

STATIONS OCCUPIED.—*Alabama*: Anniston, Double Springs, Hamilton, and Vernon. *Florida*: Archer, Blountstown, Bonifay, Bradentown, Bristol, Clearwater, Dunnellon, Fernandina, Gainesville, Green Cave Springs, Jasper, Macclenny, Montello, Pensacola, Plant City, Quincy, Sanford, and Tallahassee. *Georgia*: Alamo, Clyde, Cochran, Conyers, Dallas, Darlen, Eatonton, Hinesville, Jeffersonville, Macon, Savannah, St. Marys, Springfield, and Wrightsville. *Mississippi*: Aberdeen and Corinth.

Between January 21 and June 30 magnetic observations were made at the stations above mentioned, most of which were new stations. At some places both old and new stations were occupied.

Meridian lines were established at Double Springs and Heflin, Ala.; Blountstown and Gainsville, Fla.; Alamo, Conyers, and Darien, Ga.

Most of the stations were marked with stone posts 30 by 6 by 6 inches, with bronze magnetic station marks set in the top.

From the observations it would appear that the magnetic declination is now decreasing in some parts of Florida and Georgia.

INTERIOR STATES.

ALABAMA, CALIFORNIA, COLORADO, LOUISIANA, NEW MEXICO, OREGON, TENNESSEE, TEXAS, AND WASHINGTON.

[J. W. GREEN.]

STATIONS OCCUPIED.—*Alabama*: Huntsville. *Arizona*: Tucson and Yuma. *California*: Barstow, Chico, Dunsmuir, Gazelle, Glendale, Grants Pass, Indio, Red Bluff, San Bernardino, and Stockton. *Colorado*: Trinidad. *Louisiana*: Alexandria and La Fayette. *New Mexico*: Deming and Tucumcari. *Oregon*: Cottage Grove, Corvallis, Eugene, Glendale, Hillsboro, Junction City, and Portland. *Texas*: Amarillo, El Paso, Groesbeck, and Wichita Falls. *Washington*: Seattle.

Magnetic observations were made at the stations named between February 25 and June 16.

At Groesbeck and Wichita Falls, Tex., meridian lines were established. The observations at Tucson, Ariz., were for a comparison of magnetometer No. 20 with the observatory instruments.

At Chico, Cal., and Glendale and Junction City, Oreg., the observations for declination seemed to indicate local attraction. Observations at auxiliary stations failed, however, to indicate the presence of such local attraction.

ARKANSAS, MISSISSIPPI, AND TENNESSEE.

[E. H. PAGENHART.]

SUMMARY OF RESULTS.—Base lines: 1, primary, 6,020 meters in length. Triangulation: 200 square miles of area covered, 10 stations in main scheme occupied for horizontal measures, 4 stations in supplemental scheme occupied for horizontal measures, 14 stations occupied for vertical measures, 18 geographic positions determined, 18 elevations determined trigonometrically.

Between May 2 and May 13 the Capleville base line was measured. This base is partly in Tennessee and partly in Mississippi, and is 6,020 meters in length. Two-thirds of its length is in Mississippi. It is situated about 7 miles south of Germantown, Tenn. It crosses two small creek beds and passes through two small stretches of timber; otherwise it extends over rolling ground, either cultivated or pasture. When the base was measured the ground was in good condition for stake setting and the crops just coming up were damaged but little. Where the base crosses the State line road a concrete mark was set and connected with the triangulation by tape and one observed direction. Mr. J. S. Bilby assisted in the measurement.

After the completion of the Capleville base the observation of angles was begun in the scheme of primary triangulation between Huntsville, Ala., and Memphis, Tenn. From Northwest Base, in the vicinity of Germantown, Tenn., the work was continued westward to Memphis, where connection was made with three stations of the Mississippi River Commission and the United States Engineers, of which stations one is a permanent bench mark of the adjusted

level net. Ten primary stations and 4 supplemental stations were occupied by June 30. At all main scheme stations, with the exception of Exchange, which is on top of the Cotton Exchange Building at Memphis, observing towers were used.

Work was then resumed in the vicinity of Germantown and continued eastward.

NEBRASKA, COLORADO, UTAH, IDAHO, MONTANA, AND IOWA.

[H. E. McCOMB.]

STATIONS OCCUPIED.—*Nebraska*: Lincoln, Beaver City, and Trenton. *Colorado*: Greeley, Golden, Central City, Cripple Creek, Lake George, Salida, Leadville, Breckenridge, Fairplay, Saguache, Alamosa, Creede, Durango, Silverton, Telluride, Ridgeway, Ouray, and Grand Junction. *Utah*: Green River, Provo, Heber, Ogden, Morgan, Coalville, Brigham, and Logan. *Idaho*: Idaho Falls. *Montana*: Helena and Butte. *Iowa*: Dunlap, Exira, Griswold, and Mondamin.

The above-mentioned stations were occupied for magnetic observations during the season between July 1 and September 5.

Stations were reoccupied at Lincoln, Nebr.; Grand Junction, Colo.; Green River and Ogden, Utah; and Helena, Mont. A new station was established near the site of a former one at Greeley, Colo.

The magnetic stations were marked with limestone posts 6 by 6 by 20 inches, with a brass plate countersunk in the top. The stones were usually set flush with the ground. Considerable local disturbance was noticed at Central City and Creede, Colo., and at Butte, Mont.

Between June 13 and 30 observations of magnetic declination, dip and intensity were made at Lincoln, Nebr., and Dunlap, Exira, and Mondamin, Iowa.

As the values for the magnetic declination differed considerably from the expected values, auxiliary stations were established at each place. Three such stations at Griswold, Iowa, showed practically the same declination as the primary station. Two such stations at Exira and Dunlap, Iowa, also gave practically the same declination as the primary stations. At Mondamin, Iowa, however, values were obtained which differed considerably on going only a short distance from the primary station. Six auxiliary stations were occupied besides the primary station and two extra stations were occupied for dip alone. Local magnetic disturbances appear to be common in this section of Iowa, and surveyors encounter considerable difficulty in using the compass.

MONTANA, WYOMING, IDAHO, COLORADO, UTAH, TENNESSEE, ARKANSAS, AND MISSISSIPPI.

[J. S. BILEY.]

SUMMARY OF RESULTS.—Reconnaissance: 850 miles of progress made, 44,050 square miles of area covered, 185 lines of intervisibility determined in main scheme and 81 secondary scheme, 69 points selected for main scheme and 22 for secondary scheme, 3 base lines selected 14,400, 6,650, and 7,590 meters in length. Base lines: 3 primary base lines 11,300, 6,650, and 6,000 meters in length, prepared and measured in cooperation with observing party. Triangulation: 4 stands for instruments built 29 observing tripods and scaffolds built; average height, 82 feet.

The measurement of the El Paso base line, begun on July 7, was completed on July 23 and preparations were at once begun for the

measurement of a base line at Cheyenne, Wyo., in the vicinity of the line Waddill-Whitaker.

Between July 28 and August 11 the base site was prepared, the necessary levels run, the base measures made, and the base connected with the triangulation. In the measurement of these two base lines Mr. Bilby cooperated with C. V. Hodgson.

On the completion of the measurement of the Cheyenne base line arrangements were made for beginning a reconnoissance from Salt Lake to the Canadian boundary. This work was begun on August 20 and was completed by October 31.

The line Ogden Peak-Pilot Peak was selected for the base starting from the transcontinental triangulation, and connections were made at the northern end of the scheme in the vicinity of Sweet Grass hills with the triangulation along the forty-ninth parallel. The distance from the base starting from the transcontinental triangulation to the forty-ninth parallel triangulation as measured through the scheme is 555 miles. The work was completed, including the field records, in $2\frac{1}{2}$ months, and the total cost was about \$850, or \$1.52 per mile of progress. This is the lowest unit cost of which there is record.

All of the stations except 3 are on mountain peaks and can be approached over fairly good roads to the foot of the mountains and by pack animals from there to the station. In all there are 26 primary stations in the main scheme, including base net and Laplace stations. Only one signal is required, a 30-foot signal at Chester west base. Practically no clearing of timber is required, and only stands for the instruments are needed. A base line was located in the vicinity of Chester, Mont., near the northern end of the scheme, and 2 Laplace stations were selected, one at Bozeman, Mont., and the other at Chester, Mont.

Connections were made with 4 bench marks, with monuments of the Wyoming-Idaho and Idaho-Montana boundaries, with the triangulation of the Missouri River and that of the forty-ninth parallel, and with stations of the United States Geological Survey at many points along the scheme.

Between November 1 and February 9 a reconnoissance was made for primary triangulation from Little Rock, Ark., westward to a point on the ninety-eighth meridian.

Field work was begun November 25, the intervening time being occupied in travel to the field and making the necessary preparations. By February 9 all field work and records had been completed and the party equipment made ready for shipment to the next locality of work.

The reconnoissance was begun at stations Shinall-Reynolds in the vicinity of Little Rock, the two most westerly points of the reconnoissance made in 1912. Starting from these two points the scheme was swung to the southward of the Arkansas River; westward to the vicinity of McAlester, Okla., and thence westward to Arbuckle Mountain, Table Mountain, and Purcell, triangulation stations of the ninety-eighth meridian. The distance measured through the axis of the scheme is about 295 miles. In the eastern half of the scheme the country is very rough, the stations are on the high ridges and mountains, and with few exceptions the points can be reached only with pack animals. The country is heavily timbered in this part of the

scheme, but on the tops of the ridges and peaks the timber is small and of no value, so that the lines can be readily cleared and only stands for the instrument are required.

On the western half of the scheme nearly all of the stations can be reached by wagon, and the hills and ridges are flat and covered with timber, so that signals are necessary to overcome obstructions. In all there are 43 primary stations in the main scheme, including the base-net stations and 2 Laplace stations. Signals ranging from 30 to 60 feet in height are required at 17 stations and stands for the instrument at 26 stations. The average height of the signals was 42 feet.

During the progress of the work provision was made for two Laplace stations and one base line. Connections were provided for with 3 leveling bench marks and 4 posts marking the boundary between Arkansas and Oklahoma, and also with several triangulation stations of the United States Geological Survey.

In March work was begun on the erection of signals for the triangulation between Memphis, Tenn., and Huntsville, Ala., beginning at Memphis and working eastward. By June 30 signals had been built at 25 primary stations and at 4 secondary stations, all of which were marked with station and reference marks.

Tripods and scaffolds were built at all stations, the average height of the tripod head being 62 feet above the station mark. In addition to this a 20-foot superstructure was built on each of the signals, making the average height of the light stand 82 feet.

On May 8 and 9 the chief of the signal-building party aided in the measurement of the Capleville base line.

MONTANA.

[JOHN H. PETERS.]

SUMMARY OF RESULTS.—Leveling: 190 permanent bench marks established, 554.5 miles of levels run.

On July 7 work was begun for extending the line of precise levels from the bench marks established at Butte, Mont., northward along the Great Northern Railway to Shelby, Mont., and thence eastward along the Great Northern Railway toward Crookston, Minn.

In order to check the elevations of the bench marks at Butte the line of levels was extended to the southward of Butte for a distance of 7 miles, touching upon 8 bench marks of the existing level net.

Going northward from Butte the line follows the Great Northern Railway through the cities of Helena and Great Falls to Shelby, and thence eastward a distance of 18 miles to the small town of Devon, Hill County, Mont., at which point the season's work ended.

In accordance with supplemental instructions a line was run from the main line at Shelby westward a distance of $2\frac{1}{2}$ miles to Virden, Mont., and thence northward along the Canadian Division of the Great Northern Railway to the United States and Canada boundary at Sweetgrass, Mont. (Coutts, Canada), at which point a connection was made with bench marks of the United States and Canada Boundary Survey and with bench marks of the United States Geological Survey.

At frequent intervals during the progress of the work connection was made with bench marks established by other surveys, including, besides the organizations named, the Missouri River Commission, the United States Reclamation Service, and the Great Northern Railway. Whenever a line of levels of another survey was intersected, special effort was made to secure a connection with at least two bench marks of that line. In all 114 permanent bench marks were established and 336 miles of progress was made.

In the latter part of March work was begun on the extension of a line of precise levels from Butte, Mont., to Pasco, Wash., via Spokane, Wash., with spur to the Canadian boundary from Sand Point, Idaho. Work was begun at Missoula, Mont., from which point the line was extended 84 miles westward along the branch of the Northern Pacific Railway, which follows the Clark Fork River. The line was then extended southeastward to Silver Bow, Mont., where connection was made with bench marks of the adjusted level net. The party was then moved back to the westward of Missoula, where it began working toward Spokane, Wash. One motor and one hand velocipede car were used for transportation in the work of the two seasons, and the rate of progress made averaged 72.5 miles per month. By June 30 the line had reached Plains, Mont., a distance of 218.5 miles from Silver Bow.

MINNESOTA AND NORTH DAKOTA.

[C. M. CADE, July 1 to Sept. 9; GEORGE D. COWIE, Sept. 10 to Nov. 10, 1913, and May 1 to June 30, 1914.]

SUMMARY OF RESULTS.—Leveling: 505 miles of line completed, 250 bench marks established.

On July 1 a party was organized at Crookstown, Minn., to carry the line of precise leveling from that place westward along the line of the Great Northern Railway toward Butte, Mont.

Two of the bench marks in the city of Crookstown had apparently been disturbed by the settling of the structures on which they were placed. Two others were found of which the elevations were practically unchanged, and one of these (City) was taken as the initial bench mark for the line of levels.

With the permission of the Great Northern Railway velocipede cars were used for the transportation of the party and instruments.

On September 10 the charge of the party was transferred to George D. Cowie.

The line of precise leveling was carried to Berthold, N. Dak., closing on bench marks T4, U4, and V4. Then a branch line was run from Minot, N. Dak., to Portal, N. Dak., along the Minnesota, St. Paul and Sault Ste. Marie Railroad tracks, and a connection made with bench marks whose elevations had been determined by Canadian surveyors at the boundary monument west of the Canadian Pacific Railway station.

The grades throughout the line were low and the weather during the latter part of the season was excellent.

Permanent bench marks were established along the line of the railroads every 2 or 3 miles and on public buildings in towns. The for-

ward and backward runnings were made on different days and under different conditions of weather.

The bench marks used were Coast and Geodetic Survey bronze discs set in buildings or bridge abutments, iron posts with bronze caps on top and iron flanges at the bottom, stone and reinforced concrete posts with bronze discs, and hollow squares cut in masonry foundations of water tanks and in the steps or copings of permanent buildings.

Permanent bench marks were set out but not connected by levels along the line of the Great Northern Railway west of Berthold as far as Manitou, a distance of 45 miles, for use during the next field season.

Work was resumed in May, 1914, at Berthold, N. Dak., and by the close of the fiscal year the work had been carried to the vicinity of Calais, Mont., a distance of 164 miles.

Field work closed for the season on November 10.

ARKANSAS, MICHIGAN, MINNESOTA, MISSOURI, AND WISCONSIN.

[WALLACE M. HILL.]

STATIONS OCCUPIED.—*Arkansas*: Charleston, Conway, Fayetteville, Fort Smith, Huntsville, Lonoke, Morrilton, Ozark, and Paris. *Michigan*: Athens, Battle Creek, Caledonia, Lowell, Ludington, and Wayland. *Minnesota*: Bethel, North Branch, Rush City, and Zimmerman. *Missouri*: Kansas City (new station). *Wisconsin*: Balsam Lake, Birchwood, Clintonville, Cumberland, Frederick, Hurley, Ingram, Park Falls, Rice Lake, Seymour, and Tomahawk.

During the season from July 1 to December 13 new magnetic stations were established and magnetic observations were made at the stations named above.

Old stations were recovered and magnetic observations were made at Kalamazoo, Mich., Ladysmith, Wis., and Kansas City, Mo. (old station).

Magnetic observations were made for the investigation of the extent of local magnetic disturbances at Green Bay, Albert Storm's farm, Black Creek, Appleton, Van Buskirk, Saxon, and Mellen, all in Wisconsin. These places were occupied in an attempt to determine the approximate area over which an unusual local disturbance was found to affect the magnetic elements, but the stations were not marked.

Observations were made at the first four places on account of an unusual disturbance about Seymour, Wis., and at the last three places on account of a similar disturbance at Hurley, Wis. Meridian lines were established at Wayland, Mich.; Seymour, Birchwood, and Balsam Lake, Wis.; and Ozark and Conway, Ark. A meridian line at Fort Smith, Ark., was verified.

The local disturbances at Seymour and Hurley, Wis., are probably due to large deposits of magnetic ore. At these places there is much uncertainty as to property lines. All surveys are made with the compass, and the magnetic declination is found to differ as much as 1 degree in 6 or 7 miles.

In nearly all cases the stations established were marked with stone posts approximately 30 by 6 by 6 inches, with bronze marks set in the tops.

COLORADO, MONTANA, WYOMING, SOUTH DAKOTA, NORTH DAKOTA, ARIZONA, NEW MEXICO, AND TEXAS.

[C. V. HODGSON.]

SUMMARY OF RESULTS.—Base lines: 2 primary, 11,289 meters and 6,650 meters in length. Triangulation: 25 square miles of area covered, 4 stations in main scheme occupied for horizontal measures, 4 stations in main scheme occupied for vertical measures, 2 geographic positions determined, and 2 elevations determined trigonometrically. Latitude and azimuth work: 37 latitude stations occupied, 2 azimuth stations occupied.

The work of this party during the season from July 15 to October 15, 1913, consisted in primary base measure and latitude observations along the one hundred and fourth meridian triangulation between Colorado and the Canadian border. Two bases, the El Paso base and the Cheyenne base, were measured with satisfactory results, and 25 latitude stations and 2 azimuth stations were occupied.

A motor truck was used for the transportation of the party and equipment, resulting in a considerable saving of time and expense.

The latitude observations were made with a zenith telescope, and it was found that with this instrument the observations of 18 pairs of stars on a single night were sufficient to insure the required degree of accuracy, which was a probable error of $\pm 0''.10$. A portable wooden tripod was used as a stand for the instrument. During the next season a very much lighter stand, made of aluminum, was used.

The El Paso base was measured in cooperation with J. S. Bilby, who prepared the base, ran the levels, and furnished the additional men required. The same tapes and method of measurement were used as on the Provo base during the previous season.

The Cheyenne base was also prepared for measurement by Mr. Bilby, and the same methods were used in the measurement as on the El Paso base.

The work of observing latitudes was begun after the measurement of the El Paso base, and was continued without interruption during the remainder of the season, except for the measurement of the Cheyenne base.

During August, besides the measurement of the Cheyenne base and the occupation of 4 triangulation stations, 10 latitude stations were occupied, the roads in the region traversed being in better condition than those encountered later in the season.

In May observations were begun for the determination of latitude at stations along the Texas-California arc of primary triangulation and on the California-Nevada boundary.

For the transportation of the party and equipment the motor truck used during the previous season on the one hundred and fourth meridian between Colorado and the Canadian border was brought from Denver, Colo., to the first station to be occupied at Barstow, Tex. From this point the work progressed steadily, and by June 30, 12 latitude stations had been occupied.

ARIZONA.

[W. W. MERRYMON and A. F. BEAL.]

The regular observations of the three magnetic elements were continued during the year at the Coast and Geodetic Survey magnetic observatory at Tucson, Ariz., without serious interruption.

The instruments are in good adjustment and satisfactory records have been obtained.

The scale value and absolute observations have been made at the usual times.

The magnetograph has been kept in continuous operation, recording changes in declination, horizontal intensity, and vertical intensity.

Chronometer corrections were obtained at regular intervals and time was also obtained from observations of solar transits.

The Bosch-Omori seismograph was kept in practically continuous operation. Twenty-four earthquake shocks were recorded.

The usual meteorological observations were continued and the results transmitted to the Weather Bureau.

PACIFIC COAST.

WASHINGTON.

[F. H. HARDY, Commanding Steamer *Gedney*.]

SUMMARY OF RESULTS.—Triangulation: 31 square miles of area covered, 8 signal poles erected, 7 stations occupied for horizontal measures, 9 geographic positions determined. Topography: 6 square miles of area surveyed, 16 miles of general coast line surveyed, 3 miles of shore line of rivers surveyed, 2 miles of shore line of creeks surveyed, 2 topographic sheets finished. Hydrography: 5 square miles of area covered, 177.6 miles run while sounding, 4,186 angles measured, 9,208 soundings made, 2 tide stations established, 1 hydrographic sheet finished.

Between January and March a revision was made of the hydrography and topography of the water front at Bellingham, Wash., extending from a little east of the cement company's wharf to the bell buoy. The hydrography was carried out to the 30-foot curve. The improvements on Eliza Island were shown on a separate topographic sheet.

Triangulation stations Francis, John 2, Chuckanut, Sandstone, Hodge, Gnarl, Eliza, Three Rocks, Spring, and Lummi South were recovered and re-marked.

Stations White, Samish, Inianti, Rain, Fairhaven, Dump, Sehome, Eldridge, Crib, and Town were searched for but not found.

Stations Chuckanut, Francis, and John 2 were occupied and Town 2 and Beach were established and determined and a number of conspicuous objects were determined in position.

A search was made for a reported rock off the west coast of Cyprus Island in the vicinity of Strawberry Island, and the report proved to be erroneous.

In this vicinity triangulation stations Obstruction Pass, North Blakely, South Blakely, and North James were recovered and re-marked. The tidal bench mark in Obstruction Pass was recovered and re-marked and a new one established.

Tidal observations were made at Bellingham from February 6 to March 23.

[G. T. RUDE.]

SUMMARY OF RESULTS.—Triangulation: 27 square miles of area covered, 10 signal poles erected, 10 stations occupied for horizontal measures, 54 geographic positions determined, 9 old stations re-marked, 10 new stations marked, 47 reference marks established.

A search for old triangulation stations on Lake Washington was begun February 18.

A number of the old stations were found and re-marked and new stations were established where necessary.

On March 24 a reconnoissance was made of Union Bay in order to connect with a monument of the Army Engineers at the east end of the Lake Washington Canal, then in course of construction. Station Monument of the Engineers, near the shore, was found and connected with the triangulation scheme of the Survey, and two disc reference marks were established.

Observation of angles was begun March 9 and continued until March 28.

All stations were marked with Coast and Geodetic Survey disc triangulation marks set in concrete posts weighing from 250 to 400 pounds each. Three reference marks were established near and connected with each station.

Old stations Cot, Brush, Bay, Groat, Ash, High, Ruin, Pick, and Dry were recovered and re-marked. New stations Clear 2, Kane, Lake, Sand 2, Brick 2, and Golf 2 were established and marked. Stations Clear 2, Lane, Kane, Cot, Sand 2, Brick 2, Brush, Golf 2, Bay, and Monument were occupied with a theodolite for horizontal angles. Forty-three intersection stations were located.

Owing to the high stage of water on the lake many of the stations were under water, making the work of re-marking difficult and in some cases impossible. When water is let into Lake Union through the new canal the water level in Lake Washington will be lowered 7 feet. This will materially change the shore line and make necessary a new survey of the water front. The stations under water at the time of this survey may then be readily found and re-marked.

[E. H. PAGENEHART.]

SUMMARY OF RESULTS.—Reconnoissance: Length of scheme 60 miles, 2,100 square miles of area covered, 18 lines of intervisibility determined, 13 points selected for scheme. Triangulation: 600 square miles of area covered, 2 signal poles erected, 10 observing tripods and scaffolds built with heights from 60 to 215 feet, 6 stations in main scheme occupied for horizontal measures, 6 stations occupied for vertical measures, 29 geographic positions determined, 29 elevations determined trigonometrically.

At the beginning of the fiscal year a party was in the field engaged in reconnoissance, signal building, and occupation of stations in the secondary triangulation between Grays Harbor and the Strait of Fuca.

In this work it was regarded as desirable to establish stations at intervals of not greater than 10 miles, and for the reason that the method of clearing lines between stations in a heavily wooded country would permit determination of only a comparatively small number of points the plan was adopted of building above the trees so as to obtain an unobstructed view of the horizon, by which means a large number of intersection stations can be obtained with the degree of accuracy required in secondary work.

Construction work in such a country is expensive, but not as much so as the observation of angles, and the latter therefore should be done at the most favorable season, which is between the middle of July and the middle of September.

In the reconnoissance, which was made between May 29 and September 20, stations were selected which would control the important

topographic features and also furnish a scheme having lines which may be observed without difficulty under ordinary conditions of weather. Considerable work was done in cutting trails to aid the construction party in reaching the stations. The construction work was done between June 5 and October 3 by a party consisting of a foreman and 5 men. Six stations were prepared which required but little work, and 15 at which building or cutting, or both, were necessary. Six miles of trail were constructed for pack animals and 9 miles of other trail. At station Sooes suitable small trees were found for a separate instrument stand and observing platform. At Ozette a large forked tree was sawed off about 60 feet from the ground and the instrument mounted in the same tree as the platform with satisfactory results. At Ellis the tops of two trees were brought within 10 feet of each other and a platform and stand built between them about 120 feet from the ground. At Lapush a platform and stand were built in three trees 187 feet above ground. At Moclips, an intersection station, a large spruce was cut off 215 feet above ground and a crow's nest built in the top. The highest point of Mount Olympus was marked and a cairn erected over the point to be used as an intersection station.

At two stations, Hoh and Taholah, a new type of signal was built. The tallest tree was selected for the stand; two other trees were felled against it as braces, and the stand and platform, in one, built upon it.

Construction work was completed except in a few instances, where slight changes in the scheme may be found necessary.

The observing party consisted of 4 persons—the observer, a recorder, a packer, and a lightkeeper. No heliotropes were used and all of the observations were made on lamps and signals. A 7-inch Berger theodolite fitted with lighting device was used in this work, as it could be easily packed over the trails and with it vertical angles could be measured, doing away with the extra instrument for verticals required with a direction instrument.

The four stations Arch Rock, Vancouver, Ozette, and Carroll, all reached by water, were first occupied, and afterwards station Sooes and Ellis. Further observations were prevented by unfavorable weather. The two quadrilaterals at the north end of the scheme were completed. The work of the season closed on November 30.

WASHINGTON, OREGON, AND CALIFORNIA.

[H. A. SERAN.]

SUMMARY OF RESULTS.—Reconnoissance: Length of scheme 64 statute miles, 600 square miles of area covered. Triangulation: 1,785 square miles of area covered, 17 signals erected, 20 stations in main scheme occupied for horizontal measures, 16 stations occupied for vertical measures, 43 geographic positions determined, and 41 elevations determined trigonometrically.

Under instructions issued June 23 work was begun on the extension of the secondary triangulation in southwestern Oregon to the southward from the vicinity of Gold Beach to connect with the coast tertiary triangulation at a point between Sister Rock and Reddings Rock off the coast of California.

Work was begun at a point slightly to the eastward of Gold Beach in the latter part of July.

After a preliminary reconnoissance made between July 29 and August 4, during which 2 stations of the triangulation of 1907 were recovered, a construction party was put at work clearing lines of sight, building trails, and erecting signals, while the chief of party continued the reconnoissance to the southward. The type of signal selected was a four-sided pyramid about 18 feet in height and from 6 to 8 feet in width at the bottom.

Fog and bad weather interfered with the progress of reconnoissance, but by September 1 stations were selected as far south as the Klamath River, Cal., and the work of observing angles was then begun in the vicinity of Gold Beach, Oreg., the construction party continuing to the southward. After the construction party had completed the programme originally laid out a search was made for the old stations of the tertiary triangulation along the coast near the mouth of the Klamath River, and 3 stations of this work were recovered.

The observation of angles was continued until November 26, when the work was closed on account of bad weather, the last station occupied being Red Mountain, about 4,000 feet in height.

In all 11 stations in the main scheme were occupied for observations of horizontal and vertical angles.

On April 28 work was resumed on the extension southward of the secondary triangulation from southwestern Oregon southward to connect with the tertiary triangulation along the California coast at some point between Sister Rock and Redding Rock, Cal.

Between April 28 and May 4 a portion of the party was engaged in a search for the old triangulation stations along the coast, established about 40 years previously. In the interval so many changes had taken place that the old descriptions of these stations were rendered practically useless. The instructions called for a connection with three of the old stations, and this was made with the stations High Bluff, Flint Rock, and Flint Ridge. High Bluff and Flint Rock had been recovered at the close of the 1913 season. These stations were re-marked with standard disk triangulation stations marks and reference points were established and similarly marked. An unsuccessful search was made for station Klamath South. Between May 7 and June 14 observations were made at stations Klamath South 2, Mound, High Bluff, Flint Rock, Flint Ridge, Red Mountain, Rattle, Child, and Gordon Mountain. Red Mountain, Child, and Gordon Mountain had been occupied in 1913, but were reoccupied in order to establish a central point in the triangle from which the work was afterwards extended and connected with the coast triangulation.

At the end of June the party had completed the connection with the coast triangulation in northern California and had been moved to Clallam Bay, Wash., to take up the work needed to complete the triangulation in the Olympic Peninsula, begun in 1913 by the party of E. H. Pagenhart.

OREGON.

[E. B. LATHAM.]

SUMMARY OF RESULTS.—Triangulation: 73 square miles of area covered, 150 signal poles erected, 129 stations in main scheme occupied for horizontal measures, 12 stations in supplemental schemes occupied for horizontal measures, 271 geographic positions determined. Topography: 16 geographic positions of light stations determined topographically.

The work of determining the geographic positions of aids to navigation and prominent objects along the Columbia River was in progress at the beginning of the fiscal year. In this work the triangulation stations established by the United States Engineers were used wherever practicable.

The positions of light stations between Puget and Walker Islands were determined by sextant angles and tape measurements plotted on photographs of the original sheets. On this stretch of the river conditions during the high-water stage were unfavorable to the carrying forward of a triangulation with stations on the banks of the river which would see the light stations.

From Walker Island Light Station to Swan Bar (upper) Light Station, in the city limits of Portland, Oreg., all light stations except Coffin Light were determined by triangulation.

The triangulation from the base Mount Coffin, Rinearson, Huntington (recovered Coast and Geodetic Survey stations), extends down the river to Walker Island Light Station and to the United States Engineer's line Quarry-Slaughter.

From the line Slaughter-Quarry (United States Engineers and Coast and Geodetic Survey, 1913) the triangulation is completed to the line H26₂-H23₂ (United States Engineers) through a system of single triangles.

Overlapping this work is the Coast and Geodetic Survey triangulation from recovered base Carr-Drays Mound, extending down the river to Cowlitz River Light Station. The triangulation from the base Carr-Drays Mound joins the United States Engineers triangulation on the line H10 and H22₂. From this line the triangulation consists of the observations of the United States Engineers combined with those by the Coast and Geodetic Survey party, and with a connection at Martins Bluff (Coast and Geodetic Survey 1878-1913) extends to the recovered Coast and Geodetic Survey base Gatton-Howell.

From the United States Engineers station 42 at the junction of the Columbia and Willamette Rivers to United States Engineers station 39, above the Northern Pacific bridge there is computed a system of single triangles observed by the United States Engineers alone. From the base Caples (Coast and Geodetic Survey, 1883) to Scott (Coast and Geodetic Survey 1881-1883), there is a triangulation of United States Engineers and Coast and Geodetic Survey observations combined which extends to the line P 44.

The triangulation of 1913 combined with that by the United States Engineers consists of well-determined points near the river bank from Portland to the Columbia River entrance, except between Walker Island and Cathlamet, a distance of about 17 miles.

In the progress of the work numerous directions were observed on wharves, tangents to shore line and other artificial and natural features useful for a topographic revision, and notes were made of changes for use in correcting the charts and sailing directions.

OREGON AND CALIFORNIA.

[J. W. MAUPIN.]

SUMMARY OF RESULTS.—Reconnaissance: Length of scheme 15 statute miles, 8 square miles of area covered, 148 lines of intervisibility determined, 58 points selected for scheme. Triangulation: 4 signal poles erected, 92 old stations recovered, 86 old stations re-marked. Topography: 110 square miles of area revised, 64 miles of general coast line revised, 20 miles of creeks revised, 50 miles of roads surveyed.

Between January 21 and May 31 chart-revision work on the south coast of California was carried from the south side of Newport Bay to the town of La Jolla, a distance of 6.4 miles with a width of from 1 to 3 miles. This area was thoroughly gone over with special attention to the seaward slope, and all changes affecting the charts were noted. The positions of a number of permanent objects were determined. The old triangulation stations were permanently re-marked with standard station and reference marks set in concrete piers.

On June 8 work was begun on a resurvey of Yaquina Bay, Oreg. The work done before the close of the year was confined to reconnaissance, cutting lines of sight, signal building, and station marking. The stations, except 3, were marked with standard station marks set in concrete piers.

CALIFORNIA.

[FREMONT MORSE.]

SUMMARY OF RESULTS.—Reconnaissance: 9.9 square miles of area covered, 42 lines of intervisibility determined, 16 points selected for scheme. Triangulation: 9.9 square miles of area covered, 2 signal poles erected, 5 stations occupied for horizontal measures, 14 geographic positions determined. Hydrography: 4 square miles of area sounded, 90.3 miles run while sounding, 1,588 angles measured, 3,534 soundings made, 3 tide stations established, 3 hydrographic sheets finished.

On April 12 work was begun on a hydrographic survey at the mouth of Mare Island Straits and in Suisun Bay to develop changes reported to have taken place and to indicate the proper position for aids to navigation.

Work was begun at the mouth of Mare Island Straits; signals were erected and a tide station was established on the Magazine Wharf at Mare Island and referred to the old Bradford bench mark. Two old triangulation stations were recovered and occupied with the plane table for the purpose of cutting in the hydrographic signals. These together with a few hydrographic points that could be occupied were sufficient for the location of all points used. The survey at the mouth of Mare Island Strait served to outline the edge of the flats and the channel and indicate the proper location for the entrance buoy.

On March 22 the party moved from Vallejo to Pittsburgh to take up the work on sheet No. 2. Five triangulation points were recovered by means of which the necessary signals were located. Sounding was begun March 28 and completed March 31. The location of tule islets on the middle ground near Middle Point, the running of the tule line around Chain Island, along the shore of Van Sickle and Chipps Islands and at the entrance to New York Slough, and the location of new wharves in New York Slough occupied the party until April 3.

On April 4 the party moved to Benicia to take up the work on sheet No. 3. From two triangulation stations recovered near the western end of this sheet a triangulation was carried to the east end of Roe Island, including nearly all the hydrographic signals used on the sheet. Sounding was begun on April 11 and completed on April 15. On April 16 and 17 the positions of the new wharves within the limits of the sheet were determined and the triangulation observations were made. Work was closed on April 17.

[F. WESTDAHL.]

An officer of the Survey has continued on duty as inspector for the coast of California and in charge of the suboffice of the Survey at San Francisco.

The office work includes the collection of data relating to the charts of the Pacific coast, reported dangers, changes in aids to navigation, and furnishing information to the public concerning the work of the Survey.

Attention is also given to forwarding instruments and supplies sent from the office at Washington, the transportation of officers traveling to or from the Pacific coast points or the Philippine Islands, directing the work of the tide observer at Sausalito, carrying on the necessary official correspondence, and various other duties.

ALASKA.

[GILBERT T. RUDE, Commanding Steamer *Taku*.]

SUMMARY OF RESULTS.—Base lines: 1 base line measured. Triangulation: 261 square miles of area covered, 76 signal poles erected, 50 stations occupied for horizontal measures, 132 geographic positions determined. Magnetic work: 3 land stations occupied for observations of magnetic declination. Topography: 72 square miles of area surveyed, 66.7 miles of general coast line surveyed, 6 topographic sheets finished. Hydrography: 40 square miles of area covered, 273 miles run while sounding, 1,454 angles measured, 2,324 soundings made, 3 tide stations established, 3 hydrographic sheets finished.

At the beginning of the fiscal year the party on the steamer *Taku* was at work in Prince William Sound and had just begun the survey of the east arm of Simpson Bay. The topography and hydrography in this locality were completed by July 15. In the meanwhile a sub-party was engaged in extending the triangulation up Sheep Bay from the work of H. P. Ritter in Orca Bay.

Work was then taken up in Sheep Bay, with an advance party extending the triangulation up Port Gravina from Orca Bay. A tide staff was erected in Comfort Cove and a datum plane established. The erection of signals and topography of Sheep Bay were

begun on July 23 and the hydrography on July 1. Work was suspended in this locality on August 6 for the purpose of making a survey of the hydrography and topography at the head of Passage Canal. A subparty was left to continue the triangulation of Port Gravina.

A tide staff was erected in the small bay on the south side of Passage Canal about 6 miles from its head, and observations for the establishment of a datum plane were at once begun. Signal building was begun August 11 and completed on August 13. A preliminary measurement of a base was made with a 50-meter tape across the gravel flats at the head of the canal for topographic use. A scheme for future triangulation was laid out and the stations marked. These stations were then located, together with the intermediate points for hydrographic use, by plane table triangulation.

The hydrography and topography were begun August 15. The topography was completed, with the exception of the contouring, on August 19 and the hydrography on August 18. The contouring was completed on August 22.

Further instructions being received to carry the topographic work from the head of the canal, at least to the crest of the divide, in the direction of Turnagain Arm, the topographic survey of the valley was begun on September 4.

The topographic work was done on two sheets, one extending from station South Base at high water mark on the gravel flats at the head of the glacier, over the glacier and across the divide to the gravel flats between the west end of Portage Glacier and Turnagain Arm, including Tunnel and Turnagain shoulders, and the other, including the peaks to the southward, forming the large basin in which Portage Glacier lies.

A traverse line was run up the valley for the control of the topographic work.

It was impossible at that season of the year to get entirely across the glacier and down to the gravel flats on the Turnagain Arm side on account of deep crevasses, some of which were probably over 200 feet in depth and from 20 to 50 feet in width. The last half mile of the traverse was particularly difficult. One afternoon was consumed making this half mile and back to the smoother part of the glacier. This time was spent in cutting ice steps and in searching for snow bridges on which to cross the crevasses. The snow bridges were very unstable and dangerous.

A good view was had of the flats between Tunnel and Turnagain shoulders and of the main flats toward Turnagain Arm. Two light-colored rocks, one on each side of these flats, were determined in location and elevation by intersections from stations on the glacier, as were also a number of points on the slope of Turnagain shoulder. Tangent cuts were also taken to each side of the valley toward Turnagain Arm and the 200-foot contour sketched showing the approximate limits of the gravel flats. Numerous elevations were determined on the slope of Tunnel shoulder. It was impracticable to get any cuts on the west slope of this hill or to get into a position on the glacier where a good view of it could be had. The contours of this part of the hill were sketched on the sheet in broken lines.

Tunnel shoulder on its east side is composed of sandstone and shale. This formation continues through Taku Pass. The approxi-

mate location and elevations of possible tunnel openings were indicated on a topographic sheet which shows all the possibilities of a tunnel location and descent to tide water in both directions.

The gravel flats at the head of Passage Canal are of sufficient size, about one-half mile square, to furnish room for a railroad terminal.

The hydrographic sheet of the head of the canal shows the possible locations for a dock paralleling the shore line of the south side near the head of the passage and along the delta of Whittier Glacier. The gravel flats forming this delta are of sufficient extent for the location of coal bunkers and tracks. None of the glaciers discharge ice into Passage Canal.

The hydrographic survey was carried 5 miles down the passage from its head on a scale of 1:10,000.

The main part of the canal is too deep for anchorage, ranging from 100 to 200 fathoms. An anchorage of limited area, about three-quarters by one-quarter mile, was found and developed on the south shore about 3 miles from the head of Passage Canal, with depths ranging from 10 to 20 fathoms sticky bottom. The head of the canal is landlocked and no swell enters from outside.

After the completion of the survey of Passage Canal on September 9 a detached survey was made of Chamberlain Bay and Jackson Cove on the south shore of Glacier Island. The signal building and topography were begun on September 11, a tide staff erected, and continuous readings for datum plane begun. The hydrographic work was begun on September 12 and completed on September 16, and the topography was completed on the same date. This is a detached survey on a scale of 1:10,000. Good anchorage for small craft may be had in 5 fathoms, mud bottom, near the head of Jackson Cove. In heavy easterly weather considerable swell rolls in toward the cove, but is broken by the narrow entrance and does not enter. This entrance is very narrow but has sufficient water for any small boats or launches which would attempt to pass into such a confined channel. Anchorage for larger craft may be had in 14 and 15 fathoms, mud bottom, at the head of Chamberlain Bay.

Work was resumed in Sheep Bay on September 23 and continued until September 28. After preparing the steamer *Taku* and boats for the winter the party proceeded to Seattle arriving there October 14.

On November 22 the magnetic station at the University of Washington, at Seattle, was occupied with declinometer No. 733 for determination of vernier correction. During the season five stations were occupied with declinometer for variation, and the ship was swung once for deviation.

In the latter part of March the work of preparing the steamer *Taku* for use during the season of 1914 was begun. The party arrived at Cordova, Alaska, on April 12. Repairs to the steamer were completed May 12, and field work was begun on Passage Canal on May 16. Signal building for the triangulation to join the survey of 1912 with that of 1913 was completed June 5, when the observation of angles was begun and continued until June 19.

A base line was measured at the head of Passage Canal on June 8 and 9. The topography and hydrography were begun June 20 and 23, respectively, and were in progress at the close of the fiscal year.

[R. S. PATTON, Commanding Steamer *Explorer*.]

SUMMARY OF RESULTS.—Triangulation: 192.5 square miles of area covered, 39 signal poles erected, 1 observing station and scaffold built, 12 feet in height, 38 stations in main scheme occupied for horizontal measures, 45 geographic positions determined. Leveling: 11 permanent bench marks established, 1 mile of levels run. Latitude, longitude, and azimuth: 1 latitude station occupied, 1 longitude station (chronometric) occupied. Magnetic work: 2 land stations and 2 stations at sea occupied for magnetic observations, ship swung at 2 stations at sea. Topography: 45 square miles of area surveyed, 83.5 miles of general coast line surveyed, 4 topographic sheets finished. Hydrography: 735 square miles of area covered, 1,737.1 miles run while sounding, 6,433 positions determined, 22,708 soundings, 6 tide stations established, 16 current stations occupied, 8 hydrographic sheets finished.

During the season of 1913 the steamers *Explorer* and *Yukon* worked in conjunction on the survey of the approaches to the Kuskokwim River.

To give a connected account of the work done it is necessary to review briefly the progress made in the two preceding years.

In 1911 a party on the steamer *Explorer* measured a base at Goodnews Bay, and from this base extended the triangulation about 5 miles to the southward and 10 miles to the northward. Hydrography and topography were executed at the entrance to Goodnews Bay.

In 1912 the *Explorer* extended this work to the southward and determined points by triangulation along the shore between Goodnews Bay and Cape Newenham to control the intermediate topography, and as hydrographic signals for offshore work. One hydrographic sheet was partly completed, extending from Cape Newenham northward to the latitude of Goodnews Bay and from the shore westward to about longitude 162 degrees 25 minutes. The topography was completed between Goodnews Bay and Cape Newenham.

In 1913 parties on the *Explorer* and *Yukon* extended the survey to the westward and northward. The triangulation was carried from Goodnews Bay to Quinhagamut, a distance of 40 miles. By this means numerous mountain peaks were accurately determined for use in the hydrography.

The shore line was surveyed between Cape Newenham and Cape Peirce and from Goodnews Bay northward to Quinhagamut.

Hydrography was executed from Cape Newenham northward to latitude 59 degrees 32 minutes and from the shore westward to longitude 162 degrees 50 minutes.

This hydrography requires some detail work in places to give further development of shoal areas but is sufficiently close to give accurate information of the prevailing depths.

Astronomic observations were made to determine the latitude and longitude of a station in the triangulation with sufficient accuracy for purposes of navigation. The weather conditions were more favorable than in the preceding season and about three times as much work was accomplished. No time was lost that might be devoted to hydrography. The largest day's work was 140.5 miles.

The general plan adopted in the hydrography was for the *Explorer* to complete the survey of the area included in the 1912 sheet and then carry the work to the westward and northward, while the *Yukon* worked in the region abreast Carter Spit, confining her work to the area of alternating channels and shoals to the westward of Carter

Spit (known locally as the Crossover) and determining only the limits of the extensive shoal areas bordering the shores.

The instructions for the season directed that the hydrography of the channel from Cape Newenham to Carter beacon should be completed, and the best water developed across to the main channel of the river and of the main channel to the sea. This part of the instructions has been carried out, but it remains to be determined which of the channels traced out are the ones which lead into the river. On two occasions during the seasons efforts were made to trace into the river what seemed to be the most promising channel, but neither attempt was successful. On the first the party on the steamer *Yukon* made a reconnoissance as far as Eek Island. The results of this trip are as follows: A line of soundings in the Warehouse Channel from a point a little north of Quinhagamut to a position about 4 miles north of Warehouse Bluffs and a fairly good determination of these bluffs which form the best landmark on the lower river. Tide and current observations were made at Apigak, and a general idea obtained of the conditions to be met with in the continuation of a survey of the river.

On September 9 a second attempt was made to trace a channel into the river by a party with the steamer *Yukon*. Good water was found to a point abreast Quinhagamut, but was finally lost just above that point.

For the season beginning April 27 the following program of work was laid out for the *Explorer*:

To locate the canneries and wharves at Hooniah and Idaho Inlet, and of the submerged rock reported off the eastern entrance of South Inian Pass; to make a complete survey of Excursion Inlet and Icy Passage; and to make a hydrographic survey of Glacier Bay up to the foot of Muir Glacier.

The work was taken up in the order named, but in the meanwhile the Alaska railroad bill was passed by Congress, the Alaskan Engineering Commission had been organized and had started for the head of Cook Inlet to make location surveys preliminary to the final designation of a route by the President. Under these circumstances it became necessary for this service to carry its surveys to the head of Knik Arm, and in the latter part of May orders were issued to the *Explorer* to suspend the work originally undertaken and to proceed to Cook Inlet for this work. Accordingly, on the completion of the surveys in Excursion Inlet and Icy Passage the *Explorer* proceeded to Cook Inlet, arriving on June 6 at Ship Creek, where work was in progress at the close of the fiscal year.

[F. H. HARDY, Commanding Steamer *Yukon*.]

SUMMARY OF RESULTS.—Triangulation: 32 square miles of area covered, 3 signal poles erected, 1 observing tripod and scaffold built (42 feet in height), 3 stations in main scheme and in station in supplemental scheme occupied for horizontal measures, 4 geographic positions determined. Topography: 75 square miles of area surveyed, 43.5 miles of general coast line surveyed, 2 miles of rivers surveyed, 1 topographic sheet finished. Hydrography: 240 square miles of area covered, 884.55 miles run while sounding, 2,286 positions determined, 12,060 soundings made, 1 tide station established, 1 current station occupied, 1 hydrographic sheet finished.

The party on the steamer *Yukon* was organized at Seldovia in the latter part of April to continue, in cooperation with the party on

board the steamer *Explorer*, the survey of the approaches to the Kuskokwim River. On May 8 a rock was located at the entrance to English Bay, Port Graham.

On May 9, necessary repairs to the vessel having been completed, the *Yukon* proceeded to Port Graham where the launch *Alpha* was caulked and painted preparatory to shipment to Goodnews Bay. The *Yukon* arrived at Kodiak on May 11.

On May 21 the new cannery in Anchorage Bay was located on the chart. On the run from Chignik the courses and distances were recorded, a rough sketch was made of the shore, and various landmarks were noted. On May 29 the *Yukon* anchored off Morzhovoi in Sanotski Straits, but owing to bad weather no field work was possible there.

Passing out of the northern entrance to the straits at high water on June 1 and following the channel shown on the chart the shoalest water obtained until outside Chunak Point was 17 feet, when outside of this point and about 500 meters from it and 40 meters from the beach a sounding of 10 feet was obtained. A tide staff and bench marks were established in Traders Cove and tide observations begun. The *Yukon* arrived at Goodnews Bay on June 3 and after making arrangements for the storage of supplies and putting the *Alpha* in commission, a line of soundings was run northward to Carter Spit and a short distance into Jack Smith Bay.

As the important work was the development of the channels, plans were made for utilizing all of the available daylight hours in extending the hydrography to the northward from a line west of station Head for a distance of about 15 miles offshore.

As the topographic sheets of the locality did not include the prominent mountain range which extends about 16 miles back from the coast cuts were made upon it from the triangulation stations and the contours were traced in.

One 40-foot signal was erected at Carter for the triangulation and hydrography. One triangulation figure was completed by the occupation of Beluka, Head, and Carter. Another station, Tooth, was established and marked but not occupied. The topography from Jack Smith to Quinahagak was completed, and a reconnoissance made up the river to Apigak.

The season's work was closed on August 30, and on August 31 the party returned to Goodnews Bay where arrangements were made to lay up the *Yukon* for the winter.

[R. R. LUKENS, Commanding Steamer *Yukon*.]

The party on the steamer *Yukon* began work about the middle of June on the survey of the approaches and mouth of the Kuskokwim River.

On June 18 the main river channel was found and located from Eek Island to a junction with the survey of 1913. Work was in progress at the close of the fiscal year.

[J. B. MILLER, Commanding Steamer *Patterson*.]

SUMMARY OF RESULTS.—Triangulation: 1,131 square miles of area covered, 41 signal poles erected, 27 stations occupied for horizontal measures, 9 stations occupied for vertical measures, 80 geographic positions determined, 36 elevations determined. Magnetic work: 6 land stations occupied for magnetic observations, 4 compass declinometer stations, 3 swings of ship for magnetic deviation, magnetic elements observed at 3 stations at sea. Topography: 135 square miles of area surveyed, 176 miles of shore line surveyed, 6 miles of rivers, creeks, and ponds, 5 topographic sheets finished. Hydrography: 702 square miles of area covered, 3,313 miles run while sounding, 34,256 soundings, 9,658 positions determined, 3 tide stations established, 7 hydrographic sheets completed, 2,362 miles run with submarine sentry. Physical hydrography: 13 current stations occupied, 652 surface temperatures of water taken, 4 deep-sea soundings made.

At the beginning of the fiscal year the party on the steamer *Patterson* was engaged in surveys of the coast of the Alaska Peninsula while a detached party on land was at work on the Shumagin Islands, 120 miles distant, where it remained until October 11.

During the entire season from June 18 to October 14 the *Patterson* was occupied in a search for the reported Leonard and Anderson rocks. The whole time of the vessel was devoted to this examination to the exclusion of any other work so far as weather conditions permitted.

The Leonard and Anderson rocks are reported to lie 70 miles eastward of Unimak Pass, 45 miles off Unimak Island, and 30 miles off Sannak Island. The reports place them in 3 localities 17 miles apart and near the 100-fathom curve. One reported position falls in a depth of 400 fathoms, one in a depth of 60 fathoms, and a third in 45 fathoms. These positions are well separated from the Sannak Reefs, and well outside any indications of foul ground, and the contours of the bottom have no connection with the Sannak Reefs. The bottom is extremely flat, with very gradual slopes, except outside the 100-fathom curve, and generally has only a few fathoms slope to the mile. It is composed of black gravel and sand throughout. Although rocky bottom has been reported here no positive indications of it have been found, and in places where no sample is brought up the lead seems to show coarse shingle instead of solid rock. There is no lava or pumice.

It was proposed at the beginning of the season to cover the doubtful region with lines of soundings one-sixth mile apart; and soundings one-sixth mile apart, making necessary 3,000 miles of lines and 18,000 soundings. One-quarter of this, or 790 miles and 3,700 soundings, was completed, and the area for $3\frac{1}{2}$ miles on each side of the 100-fathom curve was gone over with the submarine sentry. The ship also passed many times over the reported positions of the rocks. in every sort of weather, cruising, riding to a sea anchor, hove to, or riding to a kedge anchor dragging over the bottom. Under all these conditions no indication of any rock was found, no breaker was seen, and no suspicious shoaling was found. The bottom contours are regular in shape and the 100-fathom curve especially so. A special effort was made to be in the doubtful region at low water of spring tides, and this was done at each new and full moon during the season with but few exceptions. At the July and August spring tides especially this was carefully observed. The Bassnett sounding tubes

were used with great success in the hydrography, verified by a vertical cast each tenth sounding. Two new style power sounding machines with releasing clutches were used simultaneously, and there was no difficulty in securing six soundings per mile in a depth of 35 to 45 fathoms at full speed. It would have been impossible to make satisfactory progress if each sounding had been made a vertical cast, at these intervals. All the sounding lines were rigidly located by sextant angles and none of them by dead reckoning. It is not possible to use the dead-reckoning method successfully here, as the currents are strong and variable. For the work with the submarine sentry, however, this method was used, and the outside limits covered were located by bearings, Sumner lines, and by the 100-fathom curve, which is fixed by the hydrography.

The survey of the Shumagin Islands was conducted by a camping party with power launches and boats. Complete surveys were carried through Popof Straits, and all of Popof Island and one-half of Unga Island were completed, including Zachary Bay and the four important anchorages of Humboldt Harbor, Coal Harbor, Baralof Bay (also called Squaw Harbor), and Delarof Bay. This comprises the most important part of the Shumagin Islands, where all the traffic passes. The other islands, harbors, and passages are used only by cod fishermen.

Triangulation was done which covered Unga, Popof, Korovin, and Andronica Islands, and a part of Nagai, and two stations were established on the mainland. It was found possible at the close of the season to complete the connection with the triangulation of 1911 at Dolgoi Island. A base line one-half mile long and an azimuth had been measured at Sand Point at the beginning of the season. The length of the triangulation along its axis was about 79 miles.

The topography covers one-half of Unga Island and all of Popof Island and was included on four sheets. Humboldt Harbor and Delarof Harbor were surveyed on a scale of 1:10,000 and the remainder on a scale of 1:20,000. The planetable was used, and traverses were carefully closed on triangulation points except along one portion of the precipitous shores. The contours of the land were sketched.

The hydrography of this locality was done with a steam launch. This work was completed in the waters adjacent to Unga Island from the northern point by way of Popof Strait to Sealion Rocks, a distance of 30 nautical miles, and along the shores of Popof Island except on the northeast coast. The work was done on five sheets. Humboldt Harbor and Delarof Harbor were surveyed on a scale of 1:10,000 and the remainder on a scale of 1:20,000. Important parts of harbors and channels, including Zachary Bay and Coal Harbor, were covered with sounding lines one-thirty-second to one-sixteenth mile apart, and general development of bottom, where no dangers were suspected, by lines one-fourth and one-third mile apart. Doubtful spots were carefully examined. All local authorities were consulted and several rocks were found by this means. Zachary Bay was found much more difficult to enter than had been reported, and also the north entrance to Popof Strait. In the south end of Popof Strait a dangerous rock was found almost on the vessel track.

Baralof Bay or Squaw Harbor, on Unga Island, was found to be a good harbor.

Tides were recorded with an automatic gauge at Sand Point throughout the season and a series of comparative tide observations was made in Zachary Bay.

Currents were observed from the ship when at anchor in a favorable position; a good series was obtained in Humboldt Harbor and some observations were made in Unga Strait and other positions from there, westward to Unimak Island. As is well known there is a continuous current westward along the Alaska Peninsula. This is strongest at the beginning of northeasterly or easterly storms and on the day before they begin. The tides at such times have but little effect on the current. The magnetic observations secured include a new station at Sand Point and ship swings for the three elements in Popof Strait, Pavlof Bay, and off Sannak Island. An unsuccessful search was made for local attraction reported between Dolgoi Island and the mainland. There are apparently small local attractions of 2 or 3 degrees at many places along this coast and among the islands, and many of the pebbles found along the shore will affect a sensitive needle if held near it, but no large attraction was found in the places visited. Four ship swings were made on the voyage from Unalaska to Honolulu, for variation only. The usual meteorological observations were made for the Weather Bureau during the season.

Before starting for Alaska the ship was fitted with a radio telegraphic set which was in use throughout the season. The greatest distance over which signals were sent was 1,300 nautical miles on the voyage from Unalaska to Honolulu.

The survey of the Shumagin Islands was resumed in May. The season's work was planned to include a careful survey of the outer coasts of Unga and Popof Islands and all of Korovin.

The work done by June 30 consists in the location of additional intersection stations by triangulation, the beginning of the topography and hydrography on Nagai Island, and the completion of the survey of the two principal harbors on Nagai Island, and of a large area off the coast. The above work was done by a detached party.

The party remaining on the ship was engaged on work in various localities as the conditions permitted. The triangulation was extended northeastward along the mainland coast, and topographic and hydrographic reconnaissance was carried along with it. Some work was done as far as Kupreanof Harbor and Ivanov Bay. A complete line of soundings was run from Cape Newenham to Unimak Pass, in Bering Sea, a distance of 305 miles.

Tides were registered by an automatic gauge in the Shumagin Islands. Current observations were made by the ship at anchor whenever the anchorage was open to currents. Magnetic observations were made at sea and five swings of the ship secured. Surface temperatures of sea water were taken on the voyage from Honolulu to Alaska.

In June the *Patterson* conveyed the Yukon party from Unalaska to Goodnews Bay and assisted in launching the steamer *Yukon*, which had been hauled out during the winter.

[C. G. QUILLIAN, Commanding Steamer *McArthur*.]

SUMMARY OF RESULTS.—Reconnaissance: 189 square miles of area covered, 29 lines of intervisibility determined, 8 points selected for scheme. Triangulation: 555 square miles of area covered, 44 signal poles erected, 38 stations occupied for horizontal measures, 10 stations occupied for vertical measures, 77 geographic positions determined, 50 elevations determined trigonometrically. Latitude, longitude, and azimuth work: 2 latitude stations occupied, 1 longitude station (chronometric) occupied, 2 azimuth stations occupied. Magnetic work: 9 land stations occupied for magnetic declination, ship completely swung at 10 sea stations for magnetic deviation. Topography: 111½ square miles of area surveyed, 109½ miles of general coast line of rivers surveyed, 2 miles of shore line of creeks surveyed, 2 miles of shore line of ponds surveyed, 4 topographic sheets finished. Hydrography: 386½ square miles of area covered, 1,858.4 miles run while sounding, 9,650 positions determined, 30,335 soundings made, 4 tide stations established, 12 current stations occupied, 5 hydrographic sheets finished.

During the season ending September 25 the party on the steamer *McArthur* completed the following work in Cook Inlet:

The topography of the shore line was completed from the termination of the work by the same vessel in 1911 southward around Chinitna Point, including Dry Bay, Oil Bay, Iniskin Bay, and Ursus Cove, to a point just south of Rocky Cove and joining the topography of Iliamna Bay previously executed.

The triangulation was extended from signals Chinitna and Augustine (1908) through several figures to a line from the south side of Bruin Bay to the southwest side of Augustine Island, giving a good and readily accessible base for extending the triangulation into Kamishak Bay. The triangulation locates signals for the control of the entire survey, and connects with the survey of Iliamna Bay, previously on independent data.

Inshore hydrography was completed from a point northward of Chinitna Point and following the shore line to the southern side of Ursus Cove and including Oil Bay, Dry Bay, and Iniskin Bay, and joining the previous hydrography of Iliamna Bay.

The ship hydrography joins the inshore work and covers with lines spaced one-quarter mile apart the entire area northward from 1 mile north of Augustine Island and eastward to meridian 153 degrees 10 minutes. No hydrography or topography was done at Augustine Island but outside tangents were cut in with the ship.

Automatic tide-gauge observations were made at Seldovia Bay throughout the entire season. Staff readings were taken at Iniskin Bay, Seldovia, and Iliamna Bay.

Current observations were made on several days in Iniskin Bay and at various places along shore when the vessel was anchored at night.

No outlying dangers were discovered in the track usually followed by vessels. No dangers were found farther than 2 miles offshore. One shoal in the entrance to Iniskin Bay and one shoal about 2 miles east of Rocky Cove were found.

Between April 29 and June 30, 1914, the *McArthur* was engaged in general surveys in Nichols Passage, Alaska.

An automatic tide gauge was established on the wharf at Metlakatla and another on the lighthouse wharf at Ketchikan. Several old bench marks were recovered at Ketchikan and connected with the tide staff by leveling. At Metlakatla the old bench mark of 1882

was recovered and three new marks were established and connected with the tide staff by leveling. Old stations established in 1913 in Port Chester were recovered and furnished distances for the plane-table survey until the triangulation could be extended from the work of 1912. Soundings were begun as soon as the signals were located.

Four signals of the 1912 work were found standing, and two of them were selected as a base for extending the triangulation into Nichols Passage. The triangulation was connected with three of the stations in Tongass Narrows.

The triangulation was also carried into Port Chester and connected with a base line measured there in 1913, and preparations were made to continue the work into Felice Strait.

All of the stations established were marked with standard station marks, and reference points were established and similarly marked.

Topography was begun on the Port Chester sheet on a scale of 1:10,000, which was practically completed. The sheet joining Tongass Narrows, on the same scale, was completed. The remainder of Nichols Passage is being surveyed on a scale of 1:20,000.

The hydrography of Port Chester was completed and the work was extended to the southward from Tongass Narrows.

The magnetic station at the University of Washington, at Seattle, was occupied before sailing; observations were made also at the station of 1907 at Ketchikan and two triangulation stations near Metlakatla. Ship observations, consisting of swinging ship, were made at Seattle and Port Townsend, and an incomplete swing in Fraser Reach.

On May 30 assistance was rendered the Ketchikan Power Co.'s barge *Blanche*, which was waterlogged and in danger of foundering. The pumps of the *McArthur* were used in freeing the barge of water.

[R. B. DERICKSON, July 1 to Nov. 21. F. H. HARDY, Nov. 22 to June 30, Commanding Steamer *Gedney*.]

SUMMARY OF RESULTS.—Triangulation: 61 square miles of area covered, 46 stations occupied for horizontal measures, 65 signal poles erected, 57 old stations recovered, 54 geographic positions determined. Leveling: 12 permanent bench marks (tidal) established, 1.25 miles and levels run. Magnetic work: 3 land stations occupied for magnetic declination. Topography: 90.5 square miles of area covered, 203.9 miles of general coast line surveyed, 8 topographic sheets finished. Hydrography: 125 square miles of area sounded, 1,716.3 miles run while sounding, 8,783 positions determined, 27,311 soundings made, 5 tide stations established, 7 hydrographic sheets finished.

At the beginning of the fiscal year the party on the steamer *Gedney* with subparties using the launch *Cosmos* and launch *No. 117* were at work on the west coast of Prince of Wales Island to the northward of San Cristoval Channel. On June 29 the *Gedney* had determined the position of the pinnacle rock struck by the steamer *Curacao*.

As it was necessary for the *Gedney* to return to Ketchikan for coal, advantage was taken of the opportunity to make supplementary soundings in Rose Inlet in the vicinity of the rock off the cannery wharf. A tide staff was erected and connected with suitable bench marks. The datum plane was obtained by simultaneous readings with a staff erected at the Kasook Inlet tide station. On July 14 the

Gedney returned to Rose Inlet and Cape Muzon. Work was carried on at Cape Muzon as the condition of the weather permitted until August 2.

On August 28 the launch *Cosmos* left the *Gedney* to locate the wreck of the steamer *State of California* in Gambier Bay and the rock on which she struck. This work was completed and the *Cosmos* rejoined the main party on September 6. From that date to the close of the season the entire party was engaged in the development of the channels through San Alberto Bay and Klawak Inlet. Surveying operations were closed on October 2.

Fifty-five old stations of the triangulation executed in 1906 were recovered and served as a base for the topography and hydrography.

The shore line of the main ship channel from Cape Lynch to Cape Suspiro and Parida is included on four sheets, the first extending from Cape Lynch to Point Desconsido, and the other three covering the shore line from Culebra Island through San Cristoval Channel, San Alberto Bay, and the south end of Klawak Inlet to Cape Suspiro. This includes most of the islands forming the northeastern boundary of San Alberto Bay and the east side of San Fernando Islands from the Palisades to Fern Point. These sheets cover the most intricate part of the coast line along the West Coast Passage from San Juan Bautista Island to Cape Lynch.

A plane-table triangulation was carried from the known position of signal Cape and the azimuth station Cape to signal Y to the southern extremity of Dall Island. About 1 mile of shore line was run in the vicinity of the outlying rocks to determine the most southerly point of the island.

In order to locate signals from the development of the rocks and shoals upon which the steamer *State of California* was reported to have struck, a base was measured in Gambier Bay and about 2 miles of shore line were rodded in. The work includes an outline of the wharf and cannery of the Admiralty Trading Co. in Gambier Bay. The topography on all of the sheets was confined chiefly to the shore line.

The hydrography completed extends from Cape Lynch to Cape Flores, connecting the surveys of 1912 with previous work at the mouth of Davidson Inlet.

A steam sounding machine was constructed at the beginning of the season for use on the *Gedney*. All soundings were taken with the wire vertical. In depths less than 10 fathoms the hand lead was used. A channel sweep was used in investigating shoals and suspicious soundings.

At Cape Muzon the hydrography was done with the ship's whale-boat. Very close development was made of the waters in the vicinity of the outlying rocks at the south extremity of Dall Island.

In Gambier Bay the hydrography was confined to locating and developing the two rocks and the wreck of the steamer *State of California*.

An automatic tide gauge was maintained throughout the season at Cruz Bay. Staff gauges were established and read in various localities during the progress of the hydrography.

Three land stations were observed for determining the magnetic declination, one in the Gulf of Esquibel, one at the north end, and one at the south end of San Alberto Bay.

At the beginning and close of the season some preliminary work was done with a view to beginning a hydrographic and topographic survey of Port Chester. A short base was measured in the vicinity of the Coast and Geodetic Survey boathouse and a scheme of triangulation laid out to extend up and down Nichols Passage and connect with the triangulation of Clarence Strait and Tongass Narrows. Four stations were occupied for the measurement of horizontal angles. All stations occupied in the reconnoissance were marked and described.

In the latter part of April the *Gedney* left Ketchikan, Alaska, arriving at Craig on April 28. An automatic tide gauge was erected at Craig and operated continuously to the close of the fiscal year. On May 1 the *Gedney* left Craig for Tonawek Bay. While at Craig the triangulation of Klawak Inlet was completed and a reconnoissance made to the northward.

The topography from the northern limit of the *Gedney's* work of 1913 was completed through Tonawek Narrows to join with previous work in Sea Otter Sound. The triangulation of this area was also completed.

The hydrography from the northern limit of previous work by the *Gedney* through to the previous work in Sea Otter Sound was completed. In the southern part the hydrography was not extended eastward of the line from the small island off Culebra Island to the small island about $2\frac{1}{2}$ miles to the northward of it. To make a complete chart this should be done, but for the purpose of a channel through to Sea Otter Sound it was unnecessary.

The channel was dragged over with a wire set at 6 fathoms. The bottom was found to be very irregular and much time was spent in developing localities where shoals were indicated, most of which were gone over with the drag.

Some hydrography was done in the southern part of the area surveyed in previous years, and the drag work was extended through the channel inside the island on which triangulation station Peep is located to the 20-fathom curve. The cannery buildings at Karheen were located, and the bight on which they are situated was both dragged and sounded.

On June 13 surveys were begun in Trocadera Bay and Klawak Inlet. By June 30 the topography of Klawak Inlet was completed. The triangulation of Tonawek Bay was completed, and about 300 miles of soundings had been run and 60 miles of shore line surveyed.

[F. L. ADAMS, July 1 to June 16; J. W. GREEN, June 17 to June 30.]

The usual records of the three magnetic elements have been obtained with the photographic recording instruments at the Sitka Magnetic Observatory. The records are continuous except for slight accidental interruptions.

During the early part of the year electric power was introduced in Sitka. No effect was observed on the instruments from this cause.

Ten earthquakes were recorded during the first half of the fiscal year, and nine during the second half year.

The required absolute observations, scale-value determinations, and daily meteorological observations were made.

OUTLYING TERRITORY.

PORTO RICO.

[GEORGE D. COWIE.]

SUMMARY OF RESULTS.—Triangulation: 9 signal poles erected, 10 stations in supplemental scheme occupied for horizontal measures, 9 geographic positions determined. Leveling: 1 tidal bench mark established, one-sixteenth mile of levels run. Hydrography: One-eighth square mile of area sounded, 3 miles run while sounding, 90 positions determined, 250 soundings, 1 tide station established.

In January reconnaissance, signal building, and observations of horizontal angles were begun on Culebra Island, the use of a lighthouse tender having been obtained for transporting the party.

Buoys were determined in position and a preliminary search made for reported shoals in the entrance to Great Harbor, Culebra Island. The lighthouse tender was at the same time engaged in setting buoys in that vicinity.

One new triangulation station, Resaca 2, was established, the positions of five range beacons were determined, and all of the buoys in Great Harbor and its approaches, "the Sound" and on Grampus Shoal, were located. Beacon B, the inner beacon on the outer range, and the mooring buoys used by the Navy have been removed.

Search was made for station marks at East and West Base, but neither was found, they probably having been destroyed.

The signal building and triangulation at Fajardo for the purpose of locating hydrographic signals having been completed and a temporary tide gauge established, an examination was made of the north-west quadrant of a circle 1,400 meters in diameter with the middle point of Obispo Cayo as its center. This area was sounded over with a launch, and two shoal spots were found, as reported, with 9 and 12 feet of water over them, but no other indication of shoals. These shoals are both of coral rock and of small extent. A search was made with an improvised wire drag for shoals in the entrance to Great Harbor, and the two shoals shown on the chart were examined. Twenty feet were found on a reported 18-foot spot, 200 feet west southwest of buoy N 2½, and 20 feet on a reported 13-foot spot near the same buoy. Both are coral heads of small area. The drag, 150 feet long, was set for 22 feet depth and failed to show any shoal spots, other than those mentioned, of less than that depth, although the entire area of the shoals was examined.

Assistance was rendered by the officers and crew of the lighthouse tender at San Juan, especially in locating the shoal spots in Fajardo Harbor and the buoys near Culebra Island.

[FRANK NEUMANN, July 1 to Apr. 12; HAROLD W. PEASE, Apr. 13 to June 30.]

The regular work of the magnetic observatory at Vieques, P. R., has continued with but slight interruption during the year. Extra absolute observations were made whenever changes of base line occurred. The instruments generally were in good adjustment. Scale-value observations were made at least once each month. Time observations were made every week or 10 days with a sextant. Daily meteorological observations were made. During March and April special observations were made with magnetometers.

PHILIPPINE ISLANDS.

[P. A. WELKER, Director of Coast Surveys, July 1 to Feb. 28; W. C. Hodgkins, Director of Coast Surveys, Mar. 1 to June 30.]

The Director of Coast Surveys in the Philippine Islands, whose office is at Manila, has immediate direction of the details of the field and office work in these islands under general instructions from the Superintendent of the Coast and Geodetic Survey, makes plans for field work, and issues instructions to field parties. The results of observations made in the field are reported and discussed in the office at Manila, and drawings for new charts are there prepared and transmitted to the office at Washington for publication. The general plan of the division of expenses between the Government of the United States and the Philippine government which has applied since January 1, 1902, was observed during the year.

Except during the periods when repairs were necessary, the parties attached to the five steamers available for duty were continuously engaged in surveying.

There has been the usual exchange of results and harmonious cooperation with the naval and military authorities and the various officials under the government of the Philippine Islands.

Under the direction of the commanding officers of the vessels long series of automatic tide-gauge observations were obtained at various places throughout the islands. These are referred to in detail in the individual reports of these officers. Two gauges were loaned to the Bureau of Lands for a period of about three months in exchange for the results of the tide observations which an observer detailed from that bureau obtained with these gauges in the vicinity of the mouth of the Cotabato River, Mindanao. The automatic gauge at Manila was in constant operation during the entire year. The results of these observations prove to be of great value for use in the establishment of reference planes for surveys and in the preparation of tide tables for the use of the navigator.

The annual revision of the table of distances between ports in the Philippine Islands for the use of the Board of Rate Regulation has been continued.

The Director of Coast Surveys has continued to serve as secretary of the Philippine committee on geographic names, on which he was appointed August 9, 1911. Good progress has been made in the compilation of a list of geographic names.

The necessity for having coaling and water supply stations nearer to the localities of work has been overcome to a certain extent by the establishment of an excellent station at Port Uson, which will serve as a base for the surveys of the entire region about the Calamianes and northern Palawan.

The dispute in relation to the rights for fishing within certain boundaries in Manila Bay was referred to the Bureau of Surveys by the Secretary of Commerce and Police of the Philippine government. The points involved were thoroughly investigated and the delimitation of the boundaries indicating the rights in accordance with the best information available was indicated upon maps and transmitted to the secretary of commerce and police.

The work of reduction of the tidal and hydrographic records was kept practically up to date, and the adjustment of the triangulation and computation of geographic positions was continued.

Tracings for the publication of charts were completed and forwarded to the office at Washington for publication. The plotting of soundings on hydrographic sheets and the inking of topographic sheets turned in by the field parties were continued.

The distribution and sale of charts and publications of the Survey and the hand corrections required to charts previous to issue are attended to by the Manila office.

The preparation of notices to mariners and sailing directions for the Philippine Islands was continued.

During the year 1,612 square miles were covered by reconnoissance, 8,137 square miles of triangulation completed, 1,177 miles of coast line surveyed, 902 square miles of topography surveyed, and 37 topographic sheets completed. The hydrographic work covered 12,445 square miles, 22 tide stations were occupied, and 35 hydrographic sheets were completed.

Several new maps of the Philippine Islands were compiled in the geographic division, 5 maps were published, and progress was made in the compilation of a number of other maps, including a map of the entire archipelago on a scale of 1:1,000,000, which will conform to the plan adopted by the International Geographic Congress for an atlas of the world.

[H. C. DENSON, Commanding Steamer *Pathfinder*, July 1 to Dec. 31, 1913.]

SUMMARY OF RESULTS.—Triangulation: 1,800 square miles of area covered, 28 signal poles erected, 11 observing scaffolds and tripods built with heights from 25 to 140 feet, 47 stations in main scheme occupied for horizontal measures, 29 stations occupied for vertical measures, 134 geographic positions determined, 113 elevations determined trigonometrically. Topography: 160 square miles of area covered, 155.5 miles of general coast line run, 27 miles of shore line of rivers run, 5½ topographic sheets finished. Hydrography: 1,736½ square miles of area covered, 2,544 miles run while sounding, 6,410 positions determined, 23,549 soundings made, 1 tide station established, 7½ hydrographic sheets finished.

On July 1, the *Pathfinder* was engaged in general surveys, consisting of triangulation, topography, and hydrography, on the east coast of the island of Mindanao, between Lianga and Caraga Bays. This work was continued until October 10, when it was necessary to suspend operations on account of unfavorable weather conditions. The work accomplished during the season practically completed the entire survey of the east coast of the island, which had been in progress during the two preceding seasons. The result was gratifying as furnishing the data for the preparation of charts of a region dangerous to navigation and previously almost unknown.

The field season in this locality having closed, the steamer proceeded via Cebu and Manila to Olongapo Naval Station, where arrangements were completed on October 22 for the installation of wireless telegraph apparatus and for minor repairs. During the intervals while this work was in progress the computations, inking of topographic sheets, plotting of hydrographic sheets, and preparation of progress sketches, descriptive reports and statistics, all relating to the work on the east coast of Mindanao, were completed and submitted to the Manila office.

While the work of installation of wireless apparatus and repairs was still in progress at Olongapo, on November 1, the survey of the approaches to Manila Bay, between Subic Bay and Fortune Island, was commenced.

On November 6, the repairs and installation having been completed, the steamer proceeded to the Cavite Naval Station for coal and supplies, and, on November 10, returned to the vicinity of Subic Bay to resume the field work, which was continued without interruption until December 24, when it was necessary to return to Manila for the purpose of preparing inventories and reports and making arrangements for transferring the command.

With the survey of the approaches to Manila Bay still in progress, the transfer of the command of the steamer *Pathfinder* was effected at the close of the calendar year, 1913.

R. B. DERICKSON, Commanding Steamer *Pathfinder*.

SUMMARY OF RESULTS.—Reconnaissance: Length of scheme 20 miles, 150 square miles of area covered, 4 lines of intervisibility determined, 3 points selected for scheme. Base lines: 1 primary, 4,204 meters in length measured. Triangulation: 529 square miles of area covered, 5 observing tripods and scaffolds built, heights 15 to 125 feet, 12 signal poles erected, 15 stations in main scheme occupied for horizontal measures, 3 stations in supplemental scheme occupied for horizontal measures, 8 stations occupied for vertical measures, 16 geographic positions determined. Levelling: 1 permanent bench mark established, 3.95 miles of levels run. Topography: 144 square miles of area surveyed, 141.8 miles of general coast line surveyed, 46.1 miles of shore line of rivers surveyed, 43.5 miles of creeks and sloughs surveyed, 12 miles of roads, streets, and trails surveyed, 7 topographic sheets finished. Hydrography: 5,219 square miles of area covered, 2,277 miles run while sounding, 10,439 angles measured, 23,617 soundings made, 3 tide stations established, 8 hydrographic sheets finished.

During the second half of the fiscal year the survey at the entrance to Manila Bay was completed.

Five triangulation stations were occupied between Subic Bay and Fortune Island and the triangulation on the north side of the bay was connected with that on the south side. Topographic and hydrographic signals were located and the position of the lighthouse on Corregidor Island was determined. The survey of the shore line was continued from Mapalan Point to Cochinos Point on the north side of the entrance to Manila Bay and from Companario Island to Carabao Island on the south side. This topographic survey was confined to the immediate shore line and as much of the adjacent country as could be contoured from the coast stations.

The hydrography consisted of deep-sea soundings by the *Pathfinder* over several doubtful areas situated 6 to 10 miles off the coast, together with a complete inshore development extending approximately to the 30-fathom curve between Panibatuhan Point and Monja Rock at the entrance to Manila Bay, a distance of about 28 nautical miles.

Tidal observations were continued at a station in Binanga Bay.

On March 6 work was begun on the southeast coast of the island of Mindanao in the vicinity of Parang.

A base line 4,204 meters long was measured in the delta of the Cotabato River and connected with the triangulation formerly executed in this region. Topographic and hydrographic surveys extending east of Bongo Island from Tugapangan Point over and

through the channels of the Cotabato delta, joining previous work on both the north and south sides. Reconnaissance for the triangulation was in progress at the date of last report.

In connection with the hydrographic work a tide staff was erected at the old naval wharf at Pollock.

While making passage from the working ground in the vicinity of Parang to Zamboanga and return, sounding lines were run, the ship's position being plotted by dead reckoning.

In June the vessel was moved to Linao Bay.

The completed topography and inshore hydrography extend from north of Linao Point to north of Sangay Point. A thorough development of Port Lebak and approaches was made. This is an excellent anchorage for vessels of any draft.

A line of deep-sea soundings was run from off Quidapil Point to Sibugay Island.

[W. M. STEIRNAGLE, Commanding Steamer *Research*.]

SUMMARY OF RESULTS.—Reconnaissance: 300 square miles of area covered, 14 lines of intervisibility determined, 5 points selected for scheme. Triangulation: 1,100 square miles of area covered, 24 signal poles erected, 11 stations occupied for horizontal measures, 11 stations occupied for vertical measures, 43 geographic positions determined, 31 elevations determined trigonometrically. Topography: 77.3 square miles of area surveyed, 77.8 miles of general coast line surveyed, 5 miles of shore line of creeks run, 0.5 mile of roads surveyed, 4 topographic sheets finished. Hydrography: 539.8 square miles of area covered, 1,895.2 miles run while sounding, 7,737 positions determined, 23,480 soundings made, 4 tide stations occupied, 7 hydrographic sheets finished.

During the period of this report the steamer *Research* was engaged in the surveys of the northern part of Samar Sea, in the vicinity of San Bernardino Strait and between the islands of Samar and Masbate.

A chain of triangulation covering the western half of the area between Samar and Masbate was carried along the east coast of Masbate and over the outlying islands from Port Cataingan, north to southern Luzon and southern Ticao. The reconnaissance was also completed and stations for the continuation of the work were established to a junction with previous work in northern Ticao and Masbate. A reconnaissance was also used in the area between Burias, Ticao, and Luzon, which developed the fact that the proposed connection with the triangulation in Albay Gulf can be executed with much less difficulty, and more economically, by carrying it directly across the isthmus, instead of via Sorsogon Bay, as had been contemplated.

In the establishment of stations, little clearing was necessary except for one station on Masbate and one on Ticao. At the latter place, 14 days were spent in clearing lines of sight. In several places mounds of earth and rock, supposed to be old Spanish stations, were found.

The topographic survey of Destacado Island and the entire Naranjos group was finished and also the east coast of Masbate from Port Cataingan to Black Rock Pass. The work extended over the entire areas of the smaller outlying islands and from 2 to 3 miles inland on Masbate Island.

The hydrographic work covered, approximately, that part of the Samar Sea lying between Dumurug Point on the east coast of Mas-

bate, and the outlying islands Tagapula and Capul and the southern part of Ticao Island. Inshore hydrography with a pulling boat was executed on the west sides of Dalupiri and Capul Islands, entirely around Destacado Island and the Naranjos group, and along the east shore of Masbate from Dumurug Point to Black Rock Pass. The offshore work was all executed with the steamer.

Strong tidal currents prevail in San Bernardino Strait and the approaches. This is especially true about the shoals, where hydrographic development was extremely difficult. The currents are frequently in the nature of tide rips, running in opposite directions at places only short distances apart.

An automatic tide gauge was in operation at Mauo River, Samar, from July 1 to August 28, when it was discontinued. On the following day, August 29, it was installed at Naro Bay, on Masbate Island, where continuous observations were obtained until the close of the season in that locality, on December 16. For reduction of soundings in the immediate vicinity of the work around Naranjos Islands, a temporary tide staff was maintained in Sabariog Bay, where readings were obtained as occasion required from July 24 to September 23. For work in the vicinity of Port Cataingan, a staff was erected at Mintag Point, at the south end of the port, where readings were obtained on various days from September 13 to 20.

On December 17 work in this locality was closed and the vessel proceeded to Manila for general overhauling and repairs. En route to Manila, from December 18 to 22, an investigation of a reported uncharted shoal at Port Laguimanoc was made. The steamship *Bustamente* was reported to have grounded upon such a shoal during the month of August of this year. After a fruitless search and the obtaining of information that the steamer grounded upon a shoal already charted and which was about 400 meters west of the reported position, the vessel continued to Manila, arriving there on December 23. The following day repairs were commenced by the Bureau of Navigation and at the close of the calendar year this work was still in progress.

[PAUL M. TRUEBLOOD, Commanding Steamer *Research*.]

SUMMARY OF RESULTS.—Reconnaissance: 1,182 square miles of area covered, length of scheme 50 miles, 17 lines of intervisibility determined, 4 new stations selected for main scheme, 17 stations selected for tertiary scheme. Triangulation: 26 signal poles erected, 11 stations occupied for horizontal measures, 8 stations occupied for vertical measures, 35 geographic positions determined. Topography: 67 square miles of area surveyed, 22 miles of general coast line surveyed, 16.8 miles of shoreline of rivers and creeks surveyed. Hydrography: 80 square miles of area surveyed, 439 miles run while sounding, 1,459 angles measured, 4,775 soundings made, 2 tide stations established.

Work was resumed by the steamer *Research* in the latter part of February in the vicinity of Ticao Pass. An automatic tide gauge was installed on the southeast arm of San Miguel on Ticao Island and kept in operation while work was in progress. Tide staffs were erected on Murungburun Island in Ticlin Strait and in Butag Bay. Comparative readings were made at these stations, and bench marks were established.

Reconnaissance was made and stations selected and marked for the triangulation, and the observation of angles was begun. Intersection stations were established for the control of the topography, including

a number of mountain peaks. Upon these vertical angles were measured.

Topography was begun in Ticlin Strait, and after connecting with the work of 1902 was carried westward along the coast of Luzon. The work included a detailed traverse of the shore line controlled by triangulation stations at intervals of from 3 to 5 miles and the location of contours as far as visible from the shore line. Surveys were made of numerous salt lagoons and winding streams through the mangrove swamps. Numerous signals were located for the use of the hydrographic party.

The hydrographic work in Ticlin Strait was connected with the work executed in 1902 and 1913. The strait itself and the channels between the islands were thoroughly sounded out. A careful survey was made of the reef and bank to the southeast, south, southwest, and west of Calantas Rock. A least depth of 6 feet was found on part of the wreck of the steamer *Pharsalia*. This locality should be carefully avoided on account of the dangerous currents and eddies which sweep along the edge of the reef. Hamorauan Bank was carefully sounded and no depth less than 2 fathoms was obtained.

A search was made for a $2\frac{1}{2}$ -fathom spot shown on the chart south of Bunubug Point and at the entrance to Marinap Bay. This area was carefully gone over but no indication of shoal water was found.

During June triangulation was continued in Sorsogon Bay entrance and stations Dum and Mount Tiguib were occupied. Eleven points were determined in Sorsogon Bay entrance. The topography was continued up the Luzon coast from Agnas Point to Magallanes.

The ship hydrography was continued from Utube Bay to a point west of Inamoc and was carried out past midchannel. The launch worked offshore from 1 to 3 miles and out to depth of 20 to 70 fathoms.

Tide observations were continued at Port San Miguel and comparative readings were made at Butag Bay and in Sorsogon Bay entrance.

On June 22 the steamship *Churruca* was sighted aground on a reef west of Bantigui Point and assistance was offered but declined. Her position was determined by cuts from two triangulation stations and a range.

A hydrographic development was made of a shoal at the east end of the Cebu sea wall, showing a least depth of 15 feet.

[R. F. LUCE, Commanding Steamer *Romblon*.]

SUMMARY OF RESULTS.—Triangulation: 545 square miles of area covered, 38 signals erected, 27 stations occupied, 41 geographic positions determined. Magnetism: 2 sea stations occupied for magnetic declination. Topography: 91 square miles of area surveyed, 147 miles of general coast line surveyed, 4 topographic sheets finished. Hydrography: 508 square miles of area covered, 2,119 miles run while sounding, 8,874 positions determined, 23,518 soundings made, 3 tide stations occupied, $3\frac{1}{2}$ hydrographic sheets finished.

At the beginning of the fiscal year the *Romblon* was engaged in combined operations in the Calamianes and in building a wharf for use in establishing a coaling and water supply station at Port Uson.

Owing to the great expense and delay incident to traveling long distances between the field of work and a base of supply

where coal and water can be obtained, the necessity for establishing stations nearer to the field of work became very urgent during the previous fiscal year, and with this in view the commanding officer of the steamer *Romblon* was directed to make special examinations for locating the most favorable places about the Calamianes and northern Palawan, which resulted in the selection of Port Uson, on the northeast point of the island of the same name, and only 1 mile distant from the town of Coron, where mail and general supplies can be received about once in three weeks.

All of the coaling stations of the government of the Philippine Islands being operated by the Bureau of Customs, an attempt was made to have one established at Port Uson, which should be under similar arrangements, but, as this failed on account of the necessary facilities not being available and the estimated cost being too great, an arrangement was finally entered into under which the Bureau of Customs allotted 1,000 pesos (\$500) toward the expense of building the wharf, the Government of the United States to pay the expense for constructing the water-supply system.

In order to carry out this plan, the commanding officer of the *Romblon* was directed to purchase the necessary materials and build the wharf and water-supply system, with the force available on the steamer, without seriously interfering with the work of surveying. The materials were transported from Manila by the steamer *Romblon* and the work was commenced a few days before the close of the last previous fiscal year. By July 12, the wharf, reservoir, and water-pipe line were completed and there is now an excellent station available, which will serve as a base for the surveys of the entire region about the Calamianes and northern Palawan.

The wharf is 324 feet long and 8 feet wide, except the outer 24 feet, which is 16 feet wide. A concrete dam was built at the source of the water supply from which a pipe line was laid to the outer end of the wharf, a distance of about 600 feet, and the source of supply was surrounded by a wire fence.

As field work was in progress during the time of construction, the expense outside of materials and hire of a little extra labor was very slight.

On July 12, the wharf and water-supply system having been completed, the *Romblon* proceeded to Manila and on the following day, July 13, the steamer was turned over to the Bureau of Navigation for general overhauling and repairs.

Repairs were completed on September 8, and the ship left to resume work in the Calamianes and on the east coast of Palawan.

A considerable amount of tertiary triangulation was executed during the period of this report. This work extended from Taytay Bay, on the east coast of Palawan, to the most northern point of that island and to a connection with the work of the previous year on Linapacan Island. The actual observing of the executed scheme presented no difficulties, as the lines were all short and weather conditions were favorable, but the establishment of the several stations and the clearing of the lines of sight required considerable time on account of the densely wooded country and the great elevation of the mountain peaks upon which some of the stations were located. In connection with the regular scheme, numerous subsidiary points were located for accurate control of the topography and hydrography.

The topographic work executed consisted of the mapping of the shore of the south coast of Batas Island, the north and west coasts of Maitiaguit Island, the shore of Sharks Fin Bay on Palawan Island, the west coast of Malabuctun Island, the western of the two bays on the north coast of Linapacan Island, the north coast of Galoc Island, all of Popototan Island, and a number of unnamed smaller islands. The topographic surveys extended from 2 to 5 miles inland from the shores of the larger islands and over the entire area of the smaller islands.

Launch and boat hydrography was executed in Sharks Fin Bay, and in the region between Maitiaguit and Batas Islands; also off the south, west, and north coast of Linapacan Island, and the north coast of Culion. In these localities there were many shoals and careful development was necessary. The ship hydrography covered the area from about 1 mile off the north coast of Linapacan Island to about 1 mile north of Culion Island and extending to the westward for about 15 miles off the coast of Culion, except a patch of about 2 miles in width off the coast of Culion, which had been completed during the previous year. The entire region about the Calamianes and the island of Palawan is filled with shoals and dangers to navigation, and hydrography requiring very close development is necessary.

On November 29 an automatic tide gauge was installed on the south coast of Batas Island where continuous observations were obtained during the remainder of the year. For the purpose of facilitating the reduction of soundings, tide staffs were erected at various places throughout the region of the work, where half-hourly readings were taken during the times when hydrographic work was in progress. The datum planes for these staffs were obtained by reference to the automatic gauge established by the *Fathomer* at Port Uson, or to the automatic gauge at Batas Island.

After January 1 work was done in the vicinity of the north end of Palawan Island until January 30, when the vessel sailed for Manila. On February 11 the command was transferred to W. M. Steirnagle.

A scheme of tertiary triangulation was carried about 15 miles down the west coast of Palawan. Topographic signals were located from the triangulation.

The shore line of the following localities was mapped: West coast of Malabuctun and Mobanen Islands, south coasts of Mobanen and Pinachinyan Islands, and west coasts of Pinachinyan and Caisian Islands, with the small adjacent islands, and the shores of Silanga Bay, extending into Taytay Bay. The topography was carried inshore from 1 to 3 miles.

The following areas were covered by the hydrographic work: The bay on the south coast of Linapacan was finished, the west and south coasts of Mobanen, Malabuctun, Casian, and Pinachinyan Islands, with adjacent islands, extending about a mile offshore, the inshore work of Silanga Bay, ship work west of Culion Island, and ship work west of Mobanen and Malabuctun Islands. Lines of soundings were run radially to the coast out to about a mile from shore and outside of that usually parallel to the shore. Inside the 20-fathom curve the lines were spaced about 100 to 200 meters apart, and outside

from 200 to 250 meters apart, except that in channels, passages, or harbors lines were run not over 50 meters apart.

The automatic tide gauge on Batas Island was continued in operation.

[W. M. STEIRNAGLE, Commanding Steamer *Romblon*.]

SUMMARY OF RESULTS.—Triangulation: 284 square miles of area covered, 19 signal poles erected, 15 stations in supplemental scheme occupied for horizontal measures, 22 geographic positions determined. Topography: 42 square miles of area surveyed, 103.5 miles of general coast line surveyed, 1 mile of shore line of rivers surveyed, 3 topographic sheets finished. Hydrography: 824 square miles of area covered, 3,486 miles run while sounding, 13,333 angles measured, 35,889 soundings made, 2 tide stations established.

After the transfer of the command of the steamer *Romblon* on February 11, work was continued on the northeast coast of Palawan to join with the work of the steamer *Marinduque*. Work was begun on the off-lying islands, beginning with Casian Island and working northward toward Iloc and Linapacan Islands. At the end of May work was being extended northward to a junction with the work west of Linapacan Island and also offshore to the northward to join with the surveys in vicinity of Culion Island.

Only such triangulation was done as was required to furnish points for the topography, the main scheme triangulation having been previously completed.

The execution of the topography was difficult, owing to the rocky coast line and numerous rocks and islets. This work was making satisfactory progress at the close of the year.

The inshore hydrography required close development on account of the many coral reefs and submerged rocks. A satisfactory fairway was found leading north and south along the west side of Mobanen, Malabuctun, and Iloc Islands. Only one important shoal was found with least depth of $5\frac{1}{2}$ fathoms. The bottom offshore is uneven but the submerged hills and valleys are well defined. The ship work was done with Tanner-Blish tubes and Cosmos hand-sounding machine. An automatic tide gauge was maintained at Batas Island from the beginning of the season.

In June triangulation for topographic control was done in the area between Linapacan and Cabulauan Islands.

The topography on the north and west sides of Iloc Island was completed and a beginning made on the east side of Linapacan Island.

The inshore hydrography around Iloc Island was finished and some work done on the east side of Linapacan Island. Some progress was made in the offshore hydrography.

Tides were observed at San Miguel on the east side of Linapacan Island and comparative readings made with the automatic tide gauge at Batas Island.

[L. O. COLBERT, Commanding Steamer *Marinduque*.]

SUMMARY OF RESULTS.—Triangulation: 383 square miles of area covered, 19 signal poles erected, 3 stations in main scheme occupied for horizontal measures, 14 stations in supplemental schemes occupied for horizontal measures, 7 stations occupied for vertical measures, 19 geographic positions determined. Leveling: 5 tidal bench marks established. Topography: 92.5 square miles of area surveyed, 152.6 miles of general coast line surveyed, 1.3 miles of shore line of creeks run, 3.7 miles of roads surveyed, 5 topographic sheets finished. Hydrography: 527.5 square miles of area covered, 2,995.7 miles run while sounding, 15,622 positions determined, 87,815 soundings made, 2 tide stations occupied, 3 hydrographic sheets finished.

At the beginning of the fiscal year, from July 1 to July 11, the *Marinduque* was at Manila undergoing minor repairs. During this time the officers were engaged in compiling data of the previous season for the use of the Manila office, while the crew was engaged in cleaning and painting the ship and receiving supplies on board. On July 12 the steamer sailed from Manila for the east coast of Palawan, where field work was resumed on July 14. This was continued without interruption, except from unfavorable weather conditions during the remainder of the calendar year.

The field work of the previous season in this locality had brought the main scheme of triangulation from the Cuyos to the eastern shore of Palawan, and little additional triangulation was necessary for the commencement of the topographic and hydrographic surveys. One additional figure to this scheme was established and observed, and numerous subsidiary points for the control of the hydrography and topography were located.

Topographic work was completed on the east coast of Palawan and the outlying islands from Santa Cruz Point to 3 miles south of Bay Point, and on the east, south, and west coasts of Dumaran Island. The work was extended over the entire area of the smaller outlying islands and to a distance of about 2 miles, inshore, in Palawan and Dumaran Islands.

Inshore work, with boats and launch, was carried along the entire limits of the topographical work to an average distance of 4 miles offshore. Hydrographic work, with the steamer, was executed over about three-fourths of the area between Santa Cruz Point and southern Dumaran and extending, upon an average, about 31 miles offshore. The unfinished part of this area is immediately to the northward of Dumaran Island. Owing to the numerous shoals, dangerous to navigation, in this locality, an unusual amount of development was necessary, and the spacing of lines of soundings was much closer than is generally required. The development of all of these shoals had not been completed when it was found necessary to discontinue work on account of the unfavorable conditions during the season of the northeast monsoon.

An automatic tide gauge was operated at Araceli, where continuous observations were obtained during the entire period of this report. A subsidiary staff, for convenience in the reduction of soundings, was used at Ibobor Island, at the entrance to Calauag Bay, from which half-hourly readings were taken, daily, from August 16 to November 7.

While work was in progress in this region, coal and supplies were obtained at Puerto Princesa. Fresh water was obtained at the same

port, but under difficulty, as the source of supply was at a considerable distance from the anchorage and transportation in small boats was necessary.

At the close of the calendar year, the steamer *Marinduque* was still in the field with the work in progress.

From January 1 to 17 work was continued off the south and west coast of Dumaran Island, the vessel then being taken to Manila for repairs. The command was transferred to another officer on February 13.

[F. B. T. SIEMS, Commanding Steamer *Marinduque*.]

SUMMARY OF RESULTS.—Triangulation: 609 square miles of area covered, 21 signal poles erected, 1 observing tripod and scaffold built, 35 feet in height, 3 stations in main scheme occupied for horizontal measures, 20 stations in supplemental scheme occupied for horizontal measures, 26 stations occupied for vertical measures, 20 geographic positions determined. Topography: 67.2 square miles of area surveyed, 40.3 miles of general coast line surveyed, 2.2 miles of river surveyed, 2 topographic sheets partly finished. Hydrographic: 540 square miles of area sounded, 2,203 miles run while sounding, 10,600 angles measured, 58,853 soundings made, 1 tide station established.

From March 9 to June 30 the steamer *Marinduque* was engaged in combined surveys on the east coast of Palawan Island.

A subsidiary scheme of triangulation was extended from Dumaran Island to station Green, one of the proposed main scheme points, in order to furnish positions for the hydrography in advance of the completion of the main triangulation. It was necessary to build a signal on a $3\frac{1}{2}$ fathom shoal off Flechas Point, to carry on this scheme. The triangulation on the eastern part of Dumaran Island was connected with the line Norte-Dumaran by a central point figure. Numerous intersection points were determined for control of the topographic and hydrographic work. Some signals were built for the main scheme triangulation.

The ship's hydrography covers the area south of Dumaran Island and extends eastward to the 100-fathom curve. The location and extent of numerous shoals within 5 or 6 miles off the Palawan coast south of Palawan Island were determined.

The inshore hydrography included the area south of Dumaran to the 20-fathom curve and Dumaran Channel. Some shoal areas remain to be sounded in the vicinity of Langoy Island and elsewhere.

An automatic tide gauge at Araceli was in continuous operation during the season. A subsidiary tide gauge was established on one of the small islands in Dumaran Channel. An uncharted shoal was discovered in Iloilo Strait.

The topography extends from Dumaran Bay to the northwest point of Dumaran Island and from Esfuerzo Point to Barrio Colasian joining on with the topography to the northward. Numerous small islands in Dumaran Channel were included in the work.

In June the main scheme of triangulation was carried southwestward to the line Pagdanan-Green on Palawan Island, but station Pagdanan was not occupied. Points were selected to the southwestward. A detached party was engaged in triangulation on the west side of Palawan. Most of the inshore hydrography in Dumaran Channel was completed.

[T. J. MAHER, Commanding Steamer *Fathomer*.]

SUMMARY OF RESULTS.—Triangulation: 1,667 square miles of area covered, 54 signal poles erected, 8 stations in main scheme occupied for horizontal measures, 35 stations in supplemental scheme occupied for horizontal measures, 55 geographic positions determined. Magnetics: 5 land stations occupied for magnetic declination. Topography: 106.8 square miles of area surveyed, 289.6 miles of general coast line surveyed, 9.1 miles of shore line of creeks run, 5 topographic sheets finished. Hydrography: 2,291 square miles of area covered, 10,717.5 miles run while sounding, 38,623 positions determined, 84,951 soundings, 3 tide stations established, 45 current stations established, 2 hydrographic sheets finished.

At the beginning of the fiscal year the steamer *Fathomer* was engaged in surveying the extensive region having Quiniluban Islands about central and extending over the area bounded by Panay, Mindoro, northern Palawan, the Calamianes, and Apo Reef.

During the short periods from July 4 to July 11 and September 1 to September 10 the steamer was at Manila undergoing minor repairs, but during the remainder of the period of this report field work was constantly in progress.

A secondary scheme of triangulation was carried over Busuanga Island and the small outlying islands to the northward, closing a circuit in connecting with the work previously executed in the region about Culion and Linapacan Islands, thus completing the necessary triangulation for most excellent control of all the surveys to be executed in the Calamianes, northern Palawan, and the east coast of that island as far south as Dumaran Island. The three steamers *Fathomer*, *Romblon*, and *Marinduque* participated in this important piece of triangulation, and it is gratifying to note that it has been so successfully accomplished that the topographic and hydrographic surveys in this heretofore unsurveyed region can progress rapidly and under excellent control. In connection with the triangulation executed by the steamer *Fathomer* during the season, 50 intersection stations for topographic and hydrographic control were established, all of which were sufficiently well marked to insure their preservation at least until the surveys in the region have been completed.

Topographic surveys were executed on the south and east shores of Busuanga Island, on the east and west shores of Coron Island, and in the Cuyos. An effort was made to complete the topography in the vicinity of Coron Bay, but on account of the complement of officers being one short, a portion of this work remained unfinished at the close of the calendar year. The topography of Coron Island, which is now finished, presented considerable difficulty, as there is no beach, the rock being undercut, making a traverse almost impossible. The work in this region required a strong control. On Busuanga Island, topographic work was carried northward from the entrance to Coron Passage, but heavy seas and lack of control made it necessary to discontinue the work until a more favorable time. Work was then taken up on the south shore of Busuanga Island completing the section between Matunan Island and Quiuit. The small amount of topography executed in the Cuyos was for the purpose of developing an anchorage for the *Fathomer*, and work there was discontinued as soon as the result was obtained. Tagauayan Bay is the only anchorage in that vicinity and the wreck of a Spanish gunboat which was stranded there during a typhoon indicates that the locality can not be considered as being very safe.

Owing to the extensive area assigned to the steamer for the purpose of execution of hydrographic surveys, it was necessary frequently to change the locality of work, in order to take advantage of the most favorable weather conditions and best utilize the available time. All other work was confined, whenever possible, to the development of shoals. Between Mindoro and Busuanga, Framjee Bank and Magallanes Bank remain to be developed. Very few of the shoals in this region have ever been charted. There are numerous indications of dangers to navigation and it was necessary to space soundings in depths of 150 to 300 fathoms, as close as six to ten in 5 miles, and frequently much closer. This irregularity extends over an area of approximately 900 square miles. The submarine sentry was in use during the entire time while engaged in sounding in localities where there were indications of shoals and it proved very valuable in finding many shoals that would have been passed over if soundings had been taken in the ordinary manner.

The hydrographic work of the steamer was carried on during all of its movements, while transporting various working parties in the field and while en route for coal and supplies; the only time actually lost was while in port.

Fifteen stations for observations of the direction and strength of currents were occupied in the northern part of the Sulu Sea and in the southern part of Mindoro Strait.

Three tidal stations were in use during the season. The automatic gauge at Port Uson, established during the previous year, was in continuous operation during the entire period of this report, and at the close of the calendar year 13 consecutive months of observations had been obtained with that gauge. For convenience in the reduction of soundings tide staffs were erected at Bisucay and in Tagauayan Bay. The plane of reference at these staffs was established by means of simultaneous observations in connection with the automatic gauge at Port Uson.

Five stations were occupied for the determination of the declination of the magnetic needle. The compass courses were so slightly affected by changes in the magnetic variation that no ship swings were made.

Work was continued after January 1 and until the close of the fiscal year in the same general localities. In the early part of January hydrography between Mindoro and Busuanga Islands was continued and a partial development made of Narvaez Bank. Between January 8 and March 10 the vessel was undergoing repairs at Manila. From March 11 to the close of the year, with a slight interruption, the party was at work on the hydrography and topography of the south and west coasts of Busuanga Island, topography and hydrography in channel between Busuanga and Culion Islands, and signal building, triangulation, and hydrography in the Cuyos Islands.

The triangulation over Busuanga Island was completed and a tertiary scheme with numerous intersections carried over Coron Island. Some triangulation was done in the Tagauayan Islands to give control for an anchorage. Triangulation was begun in the Quiniluban group.

Topography was completed on the south coast of Busuanga Island and partly completed on the east coast. The north coast of Culion

Island and Port Culion were completed, and also Cocoro Island in the Tagauan group. Tagauan Island was partly finished.

The hydrography in the area between Apo Reef, Mindoro, and Busuanga Islands was nearly finished and that in the most difficult part of the area between Cuyos and Panay, including the development of some of the shoals. Some work was done in the area between Cuyos and Palawan and west of Busuanga Island. Areta shoal was partly developed. The channel between Culion and Busuanga Islands was completed. Current observations were taken at night when the ship was at anchor. Five sets of observations for magnetic declination were made. The tide observations of the automatic tide gauge at Port Uson were continued during the year. Staff gauges were read at Bisucay and Tagauayan.

All of the Cuyo Islands north of Bonbon, Cuyo Island, with the exception of Tabac Rock, were connected by triangulation and the topography of the islands was begun. Such hydrography was done among the islands as was practicable in connection with the foregoing.

HAWAIIAN ISLANDS.

[E. R. HAND.]

SUMMARY OF RESULTS.—Triangulation: 127.2 square miles of area covered, 25 signal poles erected, 23 stations occupied for horizontal measures, 10 stations occupied for vertical measures, 27 geographical positions determined. Topography: 64 square miles of area surveyed, 146.1 miles of general coast line surveyed, 46.3 miles of roads surveyed, 7 topographic sheets finished.

At the beginning of the fiscal year revision work was in progress on the island of Hawaii, the survey having been completed as far as the village of Kawaihae. By October 1 the surveys had been extended southward to Hanamalo Point, not far from the extreme southerly point of the island of Hawaii. This work includes an accurate delineation of the shore line and location of offshore rocks, a determination of the cliff heights at frequent intervals, a location of all prominent natural and artificial objects which would be useful to navigation or as hydrographic signals, and, where necessary, the development of the land forms by contours. This work was placed on four topographic sheets on a scale of 1:20,000.

The triangulation consisted in the recovery of all primary stations of the old Hawaiian Government survey which were close enough to the coast to be of value for the hydrographic work, and an extension based on these points for the purpose of locating lighthouses and other objects useful as landmarks or offshore hydrographic signals. All positions determined were intersection points, since the great number of primary stations recovered made any extension merely for topographic control unnecessary.

Four lighthouses are included in the limits of the work—at Kawaihae, Keahole Point, Kailua, and Napoopoo. These were located by triangulation and a careful determination of their heights was made.

A whaleboat was used for the transportation of the party. Between Kailua and Hanamalo Point but two sheltered anchorages were found and, as it was not safe or feasible to land on the occasional strips of beach and haul out the boat, it remained offshore all

night, anchored when the weather was favorable but lying to when the swell made this dangerous, with two men standing watch alternately.

At the end of October field work was temporarily suspended.

During the second half of the fiscal year field work was continued on the surveys of the island of Hawaii from Hanamalo Point to the southward and eastward around the coast toward Hilo, the original starting point. The topography was completed from Hanamalo Point around South Point to the Keaiwa lava flow of 1868, or about 8 miles northeast of Punaluu Landing. The triangulation was extended about 10 miles beyond, or to station Puu Kapukapu, at Keauhou, below the volcano.

The triangulation consisted of the extension of the supplemental work from the lines of the original primary survey for the purpose of topographic and hydrographic control, marking new stations and old ones where necessary and preparing descriptions of stations. Because of the frequency of primary stations and the absence of good intersection objects no triangulation was done until the survey reached Honuapo, except that Ka Lae Light at South Point was determined from three primary stations. Northeast of Honuapo, however, there were no primary stations in the vicinity of the coast, excepting Kamehame, so that it was necessary to take the base Kamehame to Puu Enuhe and extend the work both ways, southwest to Honuapo, and northeast to Keauhou.

The topography consisted of an accurate delineation of the shore line, a determination of the cliff heights at frequent intervals, indicating the form of the terrain by contours as far back as would be useful for navigation, and of marking and listing the topographic stations with a view to their use in a hydrographic survey. Where necessary for their identification the natural objects used for stations were marked with white paint or whitewash.

[J. W. GREEN.]

Field magnetic observations were begun in August for the reoccupation of stations on the islands of Kauai, Maui, and Hawaii for secular variation and also to make a magnetic survey of the crater of Kilauea. Observations were begun on Kauai, where stations were occupied at Waimea and Port Allen. A station was occupied at Lahaina on the island of Maui. On the island of Hawaii observations were made at two stations on Hilo; at Kapoho, Ka Lae, and Kilauea, all of which were repeat stations.

In the magnetic survey of Kilauea the original plan was to establish four stations at the terminals of the long and short axes of the fire pit Haleamaumau and to secure repeat observations at these four stations as often as possible extending over a period of six weeks. This work was to be supplemented by two weeks' observations at stations to be selected around the outer rim of Kilauea. On account of the dense sulphurous fumes which pass off toward the south and southwest under the influence of the trade winds, no station was possible on this side of the pit. Three stations were therefore established, going as close to the fumes as practicable on either side and halfway between these stations on the north side. Station A, on the northwest side and about 40 feet from the rim of the crater,

was abandoned after the second set of observations on account of the unstable condition of the surface layer of lava rock, and a new station A² established about 125 feet nearly due north from A. Also station C, 75 feet from the rim of the crater on the southeast side, was abandoned on account of the fumes after the first set of observations and a new station C² established, about 75 feet nearly due east of C. After obtaining two complete sets of observations at station A, two at station A², four at station B, one at station C and three at station C², an analysis of the results indicated that while a normal diurnal variation might be expected at any one station yet the wide differences in the values of the elements obtained at the different stations are differences due to location and not to time.

Ordinarily it is to be expected that as the dip increases the horizontal intensity decreases. A comparison of the results obtained at the stations around Halemaumau showed anomalous conditions in several instances, the changes in the value of the horizontal intensity and dip following no regular lines of variation. It appears also that there are numerous local centers of disturbance. Consequently, it was deemed advisable to discontinue the repeat observations at these stations and establish as large a number of stations in the vicinity of Halemaumau as possible in the time available. Accordingly, five additional stations were established. At these five stations the same irregularity was manifested as at the stations already established, confirming the idea that the abnormal variations are purely local and are due to fixed centers of disturbance, perhaps near the surface, and in no way connected with the movement of the lava column at Halemaumau. A test of specimens of the lava rock showed that the surface fragments are all magnetic, and all exhibited polarity in a greater or less degree. A perceptible change in the direction of the declination magnet was produced by moving blocks of lava rock weighing from 50 to 75 pounds to different positions in the vicinity of the instrument.

Around the outer rim of Kilauea 7 stations were established about 1 mile apart in addition to the former station near the Volcano House Hotel. These stations extend almost around the crater, but there is a gap of 1.6 miles on the southwest side. At these stations the same irregularities in dip and horizontal intensity were noted as at the stations around Halemaumau.

Polarity was found in a marked degree in fragments of basalt thrown out from Kilauea by the explosion of 1790, and this polarity probably existed at the time they were thrown out, as the end of the rock lying toward the north in some cases attracted and in other cases repelled the north pole of the magnet.

At the request of the director of the Hawaiian Volcano Observatory declination observations were made at 7 observation stations established by him around the rim of Halemaumau. The results varied from 0 to 16 degrees and were uniformly greater on the east side than on the west side of the pit.

The ascent of Mauna Loa was made on the southeast slope, and the camp was located on the southeast rim of the crater. For the ascent of Mauna Loa the observer joined a small party sent out by the Hawaiian Volcano Observatory. Four pack animals were required to carry the outfit, camping material, and supplies. The ascent was made on September 29 and 30.

The crater of Mokuaweoweo covers $3\frac{1}{4}$ square miles and is 800 feet deep. Mauna Loa is 13,675 feet above sea level.

The only instrument carried on this trip was a dip circle, the observations obtained consisting of dip and total intensity by Lloyd's method. These observations do not show the wide range in the magnetic elements obtained at Kilauea, but yet the differences are considerable. During the four days spent at the summit observations were made at six stations along the eastern and southeastern rim of the crater. At station A an approximate determination of declination was made using the compass attachment of the dip circle.

Acknowledgement is made of assistance rendered in this work by Prof. T. A. Jaggar, jr., director of the Hawaiian Volcano Observatory, who furnished transportation for the observer and his equipment and placed the facilities of the observatory at his disposal.

[J. W. GREEN and WM. W. MERRYMON.]

The regular series of magnetic observations has been maintained at the magnetic observatory at Ewa, Hawaii.

On August 6 the charge of the observatory was transferred to Wm. W. Merrymon.

The magnetic, seismographic, and temperature variations instruments have been in continuous operations with a few slight interruptions.

The routine work of keeping the recording instruments in operation, taking weekly absolute observations of the magnetic components, caring for the observatory property, and keeping up the usual reports and correspondence, has been attended to.

Between July 1 and December 31, three magnetic storms were recorded, that of October 4 to 8 being of unusual intensity, six lesser magnetic disturbances were recorded. During the same period 125 earthquakes were recorded on the Milne seismograph, varying in amplitude from microscopic to greater than the semitrace, about 17 millimeters.

Between January 1 and June 30 there were 10 magnetic storms, and 98 earthquakes were recorded.

Meteorological observations were taken twice daily and sun altitudes for time about four times each month. Meteorological reports were rendered monthly to the local office of the United States Weather Bureau.

[J. B. MILLER, Commanding Steamer *Patterson*.]

SUMMARY OF RESULTS.—Triangulation: 452 square miles of area covered, 10 stations occupied for horizontal measures, 20 geographic positions determined. Magnetic work: 1 magnetic station occupied for standardizing instruments. Topography: 16 square miles of area surveyed, 32 miles of shore line surveyed, 1 topographic sheet finished. Hydrography: 821 square miles of area covered, 1,895 miles run while sounding, 18,546 soundings made, 5,651 positions determined, 8 hydrographic sheets completed, 15 current stations occupied.

The work done by the party on the steamer *Patterson* during the winter season of 1913 to 1914, was chiefly hydrographic, since the other classes of work have been largely completed in the Hawaiian Islands.

A small amount of tertiary triangulation was done to control the survey on Lanai Island. Concluded points were determined from old stations, and four new stations were established at important points.

The topographic work done includes the shore line of Lanai Island, from Kaea Point, around the southern, eastern, and northern sides to Kaena Point. Signals were located for the inshore hydrography and all features within one-half mile of shore were shown. No contours were determined as the shores are low, but where cliffs occurred their heights were determined. Thus, the work consisted solely of closed traverses between triangulation points.

Inshore hydrography from the shore to 27 fathoms was completed on the south coast of Maui Island from Kaupo Landing to La Perouse Bay, a distance of 22 statute miles, thus completing that island; on Lanai Island, on the southern, eastern, and northern coasts from Kaea Point to Kaena Point, a distance of 32 statute miles; and on Hawaii Island around the northwestern point from Kukuihaele to Puako, a distance of 47 statute miles. Special surveys in Mala Bay, Maui Island, and Kaiaka Bay, Oahu Island, included 4 miles of coast line. The development of all these coasts was made on the same scheme; that is, by sounding lines on and off shore one-eighth mile apart, with additional lines and soundings at critical or suspicious places. No harbors are found on these coasts. At landings the sounding lines were run one thirty-second mile apart and closer. Geographic positions for locating soundings were obtained from previous topographic sheets of Maui and Hawaii Islands, and on Lanai Island were located by new topography, as explained above. The coasts surveyed are almost entirely exposed to the trade winds, the southern Maui coast and the northeast Hawaii coast especially so, and are almost unapproachable when these winds are blowing strongly. During the past winter, however, the weather conditions were greatly disturbed and abnormal, so that advantage was taken of these conditions, and work was completed which would otherwise have been impossible.

The sounding was extended from the limit of the inshore work to a distance of about 9 miles off the coasts of Maui and Hawaii; around Lanai it was extended 2 to 5 miles offshore, accordingly as it joined previous work off Maui, or was intended to join later work off Molo-kai. The limits of old and new work are now fairly continuous and definite, and conveniently situated for extending. The soundings from 27 to 80 fathoms were made at one-third to one-sixth mile intervals, with pressure tubes. The usual program was followed for such soundings, and the tubes were standardized at each tenth sounding by vertical casts. Off Maui and Hawaii the deeper soundings reached 500 to 900 fathoms and these were made by vertical casts in the usual way. Off Lanai a comparative shallow bank was found all round, and there were few deep soundings.

Current observations were made at eight localities distributed over the whole region with an average of 43 hourly observations in each locality. A 20-foot current pole was used, with a log line and pelorus. Moderately strong and well defined currents were found, with a strength as great as $1\frac{1}{2}$ knots. All of the currents are branches of the continuous ocean current which flows from southeast to northwest through the Hawaiian Islands, and which is modified by the

coasts of the islands, by changes in the barometer and the corresponding winds, and only slightly by the tides. The currents are only moderately important to navigation, as they generally run in the direction of usual vessel tracks. Tidal reducers for the soundings were obtained from the automatic gauge operated by the Corps of Engineers, United States Army, at Hilo, Hawaii, where an excellent record is obtained continuously. The tides at Hilo agree in time and range with the whole region where soundings were made, and the range of tide in the Hawaiian Islands is always small.

A small amount of work was done on the coast of Oahu Island, requiring five days in all, at the request of the commandant of the naval station, and by authority from the superintendent.

A small amount of sounding was done in Mala Bay, near Lahaina, Maui Island, to develop the proposed location for a new Territorial wharf. This was at the request of the superintendent of public works of the Territory, and copies of the results were furnished to him.

The magnetic instruments on board the ship were standardized at the Honolulu Magnetic Observatory of the Coast and Geodetic Survey. No other magnetic observations were taken in the field during the season. The routine meteorological observations for the use of the Weather Bureau were made throughout the season and were forwarded to that Bureau on the forms provided by it for that purpose.

The Hawaiian Islands lie in the track of the northeast trade winds, and much of the coast is exposed to the heavy ocean swell and is unprotected from the wind, and there are no harbors. During the last two seasons it has been found possible to work on such coasts in a moderate trade wind, however, and by exercising some care, even to anchor the ship there when it is desirable. The wear and tear on ship and outfit is greater than in many other circumstances, but is not unreasonable, and many precautions are necessary in working with launches and small boats. On these coasts commercial steamers handle cargo and passengers in ordinary weather, but it is done with considerable risk to them and to the vessels themselves, much more than in many other regions. However, during the winter 1912-13, and 1913-14, this party was favored with some intervals of variable weather, when it was quite safe and convenient to work on such coasts. The past winter was especially unusual, and several heavy storms passed over, which prevented work altogether, when at their height. Much of the most difficult part of the exposed coast is now completed, and such localities were given the preference the past season, whenever it could be done.

SPECIAL DUTY.

OCEANOGRAPHIC WORK AND CURRENT OBSERVATIONS IN GULF STREAM.

OCEANOGRAPHIC WORK.

[CHARLES C. YATES, Commanding Steamer *Bache*.]

The oceanographic cruise of the steamer *Bache* in the Atlantic Ocean and Gulf Stream from Chesapeake Bay to Bermuda and the West Indies was undertaken in cooperation with the United States

Bureau of Fisheries in accordance with the plans of the Permanent International Council for the Exploration of the Sea.

While the work was primarily suggested by the Bureau of Fisheries for obtaining information as to the ocean conditions governing the fisheries on the coasts of the United States, the physical data obtained relating to depths, currents, temperatures, and densities in the Gulf Stream and adjacent waters are of equal interest and value to the Coast and Geodetic Survey as affecting navigation and the charting of the coasts.

The *Bache* had her usual complement of officers and crew, and two officers of the Bureau of Fisheries were detailed to conduct the special studies relating to the fisheries. The work of these experts was facilitated by construction of a laboratory for their use and the addition or modification of a number of appliances required for the fishing operations.

While waiting at Norfolk for the arrival of a supply of wire for deep-sea work ordered from abroad, the *Bache* made two preliminary cruises for the purpose of adjusting compasses and testing apparatus. Some defects were developed which were corrected as far as possible before the final departure of the ship.

The special wire having arrived the *Bache* sailed from Hampton Roads on January 26. This portion of the cruise ended at Bermuda on February 7 after a stormy passage which greatly interfered with oceanographic work. During the period of 12 days occupied in the voyage to Bermuda the vessel made an average of only 67 miles a day. During an average of 15 hours per day she was either lying in the trough of the sea and drifting while making physical hydrographic observations, or going ahead dead slow, also usually in the trough, towing deep-sea fishing nets.

Owing to the rough weather the Sigsbee sounding machine on the platform overhanging the stern could not be used a greater part of the time and the drum of the Lucas sounding machine forward gave way under the accumulated pressure of wire and in doing so carried away the driving wheel.

A new sounding machine of a new type was improvised, however, from parts of other machines on board which proved extremely efficient in deep-sea work. At Bermuda the new sounding machine was reconstructed in a more permanent form, and some necessary modifications were made to the reeling machine used in deep-sea fishing.

The governor general of the islands paid a visit to the *Bache*, as did some hundreds of others, the greatest interest being taken by all in the apparatus and specimens of deep-sea fish collected.

Between February 17 and March 4 the *Bache* was making the voyage from Bermuda to Nassau, Bahamas. By request of the colonial secretary of Bermuda the first part of this voyage was devoted to a search for a reported shoal located about 20 miles to the southeastward. It was not found, and the examination made indicates that it does not exist.

The weather on this portion of the trip was more unfavorable than that from the United States to Bermuda. On February 22 and 23 the vessel was hove to in a storm about 250 miles southeast of Bermuda, and again on the 26th and 27th about 250 miles northeast of the

Bahamas. On the evening of February 28 there commenced the most severe of all the storms experienced. This culminated on the morning of March 2, when a big sea was shipped which carried away two whaleboats, smashed the starboard launch, started the coaming of one of the skylights, flooded the ship, and damaged many other parts. Fortunately no one was on deck at the time except the officers on the bridge. The wreckage was quickly chopped away without fouling the propeller.

Upon arrival at Nassau on March 4 a small supply of coal was obtained sufficient to carry the vessel to Key West, at which place she arrived March 11. No oceanographic work was done during this part of the trip.

On March 13 the *Bache* proceeded from Key West to Habana, making the regular oceanographic observations across this section of the Gulf Stream. The remainder of the cruise took the ship up the Gulf Stream in the Florida Straits to Gun Key and then across to Fowey Rocks. From there the *Bache* cruised to Jupiter Inlet, then across the Gulf Stream again and on north of Great Araco Island of the Bahamas to a final oceanographic station about 200 miles north of Hole in the Wall.

On March 23 the vessel returned to Key West, where the officials of the Bureau of Fisheries packed and shipped to Washington their specimens and outfit, and the ship took on coal and supplies.

From their nature, the results of an oceanograph expedition are not subject to a summary statistical analysis and can only be properly covered by a separate report. The following extracts from a letter of the Commissioner of Fisheries to the Superintendent of the Coast and Geodetic Survey give testimony to the value of the work accomplished:

The successful conclusion of the oceanograph cruise of the *Bache* and the value of the collections obtained impels me to express to you my appreciation of the zealous and skillful execution of the investigation.

A preliminary examination of the material collected indicates that it will throw much light on biological and physical conditions in the Gulf Stream and the western Atlantic, particularly when it is considered in connection with the investigations which this Bureau is conducting along the coast as far as the Grand Banks. The region covered by the *Bache* is vital to our general inquiry and it could not have been investigated without the invaluable cooperation of the Coast and Geodetic Survey.

I request that you convey to * * * the officers and men of the *Bache* my thanks and congratulations for the success with which the expedition has been conducted under circumstances which well might have discouraged men less zealous and conscientious.

CURRENT OBSERVATIONS IN GULF STREAM.

After the completion of the oceanographic work in cooperation with the Bureau of Fisheries, the steamer *Bache* left Key West on March 31 to occupy a station in the Gulf Stream about midway between Cuba and the Florida coast. This work was undertaken primarily to investigate a new method of measuring deep-sea currents.

An attempt was made to anchor with wire in about 600 fathoms of water a moderate-sized nun buoy provided by the Bureau of Light-houses. The operation was not successful, as the location of the buoy was lost at night by reason of failure of the searchlight of the ship.

In the morning the buoy could not be found, and presumably it was carried away by the 3-knot current.

As it was most desirable that this method of current observations, depending on the successful anchoring of a buoy in the deep sea, should be tried out, the operations were transferred to more protected waters in the vicinity of Cay Sal Bank between Cuba and the Great Bahama Bank. Here buoys or markers constructed on the ship were successfully anchored on four sides of the Cay Sal Bank, one in Florida Straits, one in Nicholas Channel, and one in the Old Bahama Channel.

At these four stations current observations were successfully made in deep water out of sight of land, and at the same time observations of deep-sea temperatures and sea-water densities were obtained.

The observations in Old Bahama Channel developed the interesting fact of the existence of two distinct ocean streams or rivers superimposed one above the other, one flowing at the rate of nearly a knot an hour away from the Gulf Stream in the Straits of Florida and extending down to a depth of about 100 fathoms, and the other at the bottom flowing in the opposite direction at nearly as great a speed.

EXHIBIT OF COAST AND GEODETIC SURVEY AT THE NATIONAL MOTOR-BOAT SHOW, NEW YORK CITY.

[W. E. PARKER.]

Arrangements were made in January for installing an exhibit of the work of the Coast and Geodetic Survey at the national motor-boat show in Madison Square Garden, New York City, and an officer was assigned to the charge of it. The Coast and Geodetic Survey exhibit was placed in the auditorium, a small room opening directly off the balcony of the main space, reserved for the educational features of the show. The exhibit occupied a favorable position in the auditorium close to the main entrance from the large hall and at a place where it was plainly visible to everyone passing into the lecture hall. It attracted much attention and was favorably commented upon. The exhibit consisted principally of sailing and general coast charts of the Atlantic and Gulf coasts, Coast Pilots, Tide Tables, Table of Depths, and Chart Catalogues. A few navigational instruments, such as a sextant, three-arm protractor, parallel ruler, etc., were included to show methods of working positions on charts. About 12 charts covering Long Island and Sound, and Hudson River and New York Harbor, were hung upon the walls. The charts were consulted quite freely by people of varied interests.

TIDE INDICATOR, NEW YORK.

[W. R. WHITMAN.]

In July an examination was made of the tide indicator at the Maritime Exchange, New York City, which was not working satisfactorily.

The apparatus was overhauled and the indicator put in good working order.

TRIANGULATION, DISTRICT OF COLUMBIA.

[O. B. FRENCH.]

SUMMARY OF RESULTS.—Reconnoissance: 16 square miles of area covered, 62 points selected for scheme. Triangulation: 16 square miles of area covered, 23 signal poles erected, 38 stations occupied for horizontal measures, 62 geographic positions determined.

After July 1 the triangulation of the Potomac River between the harbor of Washington and Little Falls, for which a reconnoissance had been made and signals erected, was continued.

The scheme selected extends from Georgetown, where it connects with the triangulation executed during the previous fiscal year, to Little Falls just above Chain Bridge. The stations on the south side are very near the south bank of the river, whereas those on the north are on the tops of the hills along the north side of the river.

Below Georgetown a scheme was carried along the banks of the river, the stations having been selected and marked and signals erected by the United States Engineers in charge of the district. The observations were made by the Coast and Geodetic Survey officer. This triangulation connects with the District of Columbia scheme and that up the river at its western end, and near the other end with the Potomac Park base.

The triangulation along the upper part of Potomac Park is composed of short lines owing to the curvature of the river and to the growth of vegetation along the shore, but good triangle closures were obtained.

The primary object of this work being to furnish points for use in a hydrographic survey of the Potomac River, and such points being numerous enough below Washington harbor and the entrance to the Eastern Branch, the triangulation was not extended farther down the river.

Field work was completed on July 19.

PRECISE LEVELS, DISTRICT OF COLUMBIA.

[GEORGE D. COWIE.]

In March, at the request of the District Engineer, Corps of Engineers, U. S. A., Washington, D. C., a line of precise levels was run between the Capitol bench mark and bench mark XI on the Aqueduct Bridge. Connection was made with various other bench marks in the District of Columbia.

TOPOGRAPHIC SURVEY OF GROUNDS OF BUREAU OF STANDARDS, DISTRICT OF COLUMBIA.

[C. L. GARNER.]

SUMMARY OF RESULTS.—Topography: 0.01 square miles of area surveyed, 0.5 mile of roads surveyed, 1 topographic sheet finished.

A special topographic survey of the grounds of the National Bureau of Standards, in the District of Columbia, was begun June 19 and completed a few days after the close of the fiscal year. The object of the survey was to revise the old map where changes had taken place, and to lay out sites for three proposed buildings to the

northward of the original grounds. After the elevations of a sufficient number of bench marks were determined by leveling a considerable amount of detail topography was done with the plane table. A special descriptive report was made on this work.

**SURVEY BETWEEN PENNSYLVANIA AVENUE AND UNION STATION PLAZA,
WASHINGTON, D. C.**

[W. E. PARKER.]

At the request of the Attorney General, made through the Secretary of Commerce, a survey was made to determine whether or not an avenue 150 feet wide from the junction of Pennsylvania Avenue and First Street NW., to the Union Station Plaza, the center line of said avenue to be located on the axis of the Peace Monument and the site of the westerly fountain of the plaza will overlap that portion of square 633 which is west of Arthur Place.

Field work was begun August 8 and completed August 20.

The Survey shows that an avenue 150 feet in width, with its center line located on the axis of the Peace Monument and the western fountain at the Union Station will pass 2 feet eastward of the southeast corner of that portion of square 633 which lies west of Arthur Place and will nowhere overlap said square.

The objects which define the axis of this avenue not being inter-visible or visible from any point within a convenient distance from both, triangulation was used only to get an approximate check on the direct measurements.

A traverse was carried from the Peace Monument along the west sidewalk of C Street to the southwest corner of New Jersey Avenue, and thence across open lots to the west fountain of the Union Station. All lines were measured twice with steel tapes 100 feet long.

A plat was made of the southern portion of the proposed avenue, showing its intersection with all improved property and extending from the Peace Monument to north of the intersection of C Street and New Jersey Avenue.

COMPARISON OF PENDULUMS FOR GRAVITY WORK, DISTRICT OF COLUMBIA.

[C. H. SWICK.]

In July and August two independent determinations were made of the periods of each of three pendulums for gravity observations, constructed by an American manufacturer for the Mexican Government.

Observations were begun on July 23 and were continued until August 3. The results of the separate determinations were found to agree closely and to be well within the limits of accuracy required for gravity work.

PHYSICAL HYDROGRAPHY, DISTRICT OF COLUMBIA, MARYLAND, AND VIRGINIA.

[H. P. RITTER.]

SUMMARY OF RESULTS.—Physical hydrography: Days on which current floats were run, 125; miles of current lines run, 723; stations used for locating current lines, 2,185; days observations of the extent and movement of muddy water, ice, etc., 201; miles, 3,670; observations, 1,428; observations of density of water, 958; days, 55; observations of temperature of water, 1,351; observations of temperature of air, 776; days, 136; tide stations established, 3; directions of currents observed at Alexandria, Va.,; number of days and parts of days, 121; number of observations, 3,415; locality of work, Potomac River, Chain Bridge to Colonial Beach; results to be shown by charts, plats, tables, etc.

In cooperation with the United States Public Health Service a party was organized for a special examination in the Potomac River to determine to what extent the tides affect and how far the currents carry the sewage from the vicinity of Washington toward the oyster beds in the lower Potomac and the amount of dilution the waters of the river undergo from the fresh-water streams or influx of salt water from Chesapeake Bay, etc.

The Coast and Geodetic Survey launch *Inspector* was assigned for use in this work.

An automatic tide gauge was erected at Alexandria, Va., on July 1, and kept in continuous operation throughout the year. Current observations were begun on August 4 and were in progress at the close of the fiscal year.

In addition to the launch, two rowboats and a small motor boat were used in following the current floats.

The observations of currents during the year had in view the determination, by means of floats, of the actual current paths in different parts of the river with special reference to the movement of the water in the vicinity of the Washington sewer outlet (1½ miles below the junction of the Georgetown, Washington, and Anacostia Channels) and to ascertain the rate and extent of the probable down-stream movement of the sewage discharge.

The method pursued in making the float observations was to follow the float with a rowboat in which were two observers with sextants. When the float was set adrift the time was noted and sextant observations were taken by the observers in the boat to fixed objects on shore or located buoys in the river. At the same time the boatman took a sounding. At frequent intervals the boat was rowed close to the float and its position again determined. These observations, together with the state of the weather, condition of the water surface, direction and force of the wind, direction of current, etc., were recorded and constitute the field record. Whenever practicable the observations were started a short time before the beginning of the ebb or flood current and continued throughout that tide.

At first all of the observations were made during daylight hours. Later on, at the end of the day's observations, the float was left to run unattended during the night and if found still floating on the following morning the observations were continued. This plan not proving satisfactory, the floats were followed continuously day and

night until the observations had to be discontinued on account of stormy weather. During the night the path of the float was located by noting the time of passing buoys, wharves, lighthouses, beacons, and other objects, estimating the distance from shore and taking soundings at the same time.

At the beginning current observations were made with a pole 15 feet long weighted so as to float a foot and a half out of water. An improved form of pole was afterwards substituted, and proved satisfactory.

The places from which the current observations were begun at various times during the season were Chain Bridge, Aqueduct Bridge, Georgetown sewer outlet, north of Highway Bridge, south end of Georgetown Channel, and south shore of Anacostia River.

In addition to the current work observations bearing on the physical condition of the river were taken at various times and places. They consisted of specific gravity determinations, water and air temperatures, color, turbidity, ice, wind, and weather conditions. The 39 localities at which observations of this kind were taken are distributed along the river from Chain Bridge to Nomini, Va., and cover about 87 miles of the river. They were taken on various dates between August 6, 1913, and June 30, 1914.

Turbidity observations which consisted principally in noting the color of the water and specific gravity observations were also made and temperatures of the air and of the water at various depths were taken.

Observations to determine the change in the direction of the current with reference to the stage of the tide were made at Alexandria, Va.

The stage of the Potomac River at Chain Bridge and of the Anacostia at Bennings Bridge was frequently determined by tide-staff readings made in connection with current work near those localities and at other times.

NORTH CAROLINA FISHING GROUNDS.

[CLEM. L. GARNER.]

SUMMARY OF RESULTS.—Base lines: 2,500 meters in length. Triangulation: 6 signal poles erected. Hydrography: 65 positions determined, 2 hydrographic sheets finished.

At the request of the North Carolina Fish Commission an officer was assigned in September to replace the buoys marking the fishing limits of Albermarle, Croatan, and Pamlico sounds, as prescribed by acts of the General Assembly of North Carolina in 1909. The buoys remaining in position were relocated when there was in any case evidence that they were not where originally placed.

Preliminary arrangements for the work were made by J. H. Leroy, fish commissioner of North Carolina.

Work was begun October 9 north of Durants Island, where the marks had partly disappeared. Progress was much retarded by unfavorable weather. On October 30 four buoys were placed in Croatan Sound marking the area limited to Dutch or pound net fishing. From this time the work was directed to the vicinity of

Durants Island and then carried southward. Buoys Nos. 6 to 11, 13 to 23, 32, 36, 37, 38, 40 to 43, 45, 48, 50, 150, 157, 158 and 160 were replaced; buoys Nos. 151 to 155, 159 and 47 were relocated, and Nos. 161 and 162 were newly established.

Positions of Nos. 33, 34, 35, 39 and 49 were marked by stakes, the water being very shallow and not suitable for buoys. Position No. 39 was left to be marked by the fish commissioner.

All of the marks placed during this survey show the limits as prescribed by law for Dutch or pound net fishing. Those placed to mark the restricted area or Oregon Inlet also mark the area in which any kind of fishing is prohibited. The laws most violated are those covering the Dutch or pound net fishing, and consequently those areas were of the first importance.

A comparatively small number of buoys that were previously placed were found. All of these were relocated and examined as to their condition and when defective new ones were placed in position. Only in a few instances were the buoys found to have been moved, and this seems to have been caused by ice during the winter season. It is found that these buoys made of juniper wood are destroyed by the teredo in from one and a half to three years.

Several old signals were found standing to the northward of Roanoke Marshes Lighthouse but none to the southward of that point.

On November 20 the work was brought to a close, 34 buoys having been placed, 7 buoys relocated, 5 stakes placed, and a number of signals repaired.

MISSISSIPPI RIVER COMMISSION.

[H. P. RITTER.]

In accordance with law an officer of the Coast and Geodetic Survey has continued to serve as a member of the Mississippi River Commission in addition to his other duties, and attended the meeting of that commission held at St. Louis, Mo., in July, the annual low-water inspection from Rock Island, Ill., to New Orleans, La., in November, and the annual high-water inspection from St. Louis, Mo., to New Orleans, La., in April.

DELEGATE TO MEETING OF AMERICAN ASSOCIATION FOR ADVANCEMENT OF SCIENCE.

[WILLIAM BOWIE.]

In December the inspector of geodetic work as a representative of the Department of Commerce attended the meeting of the American Association for the Advancement of Science, held at Atlanta, Ga., and read before the association two papers based on the scientific work of the Coast and Geodetic Survey. One of these papers read before the section of engineering and mechanical science was entitled "The substitution of metal tapes and wires for bars in base measurement," and the other, read before the section of physics, was entitled, "Isostasy and the shape and size of the earth."

INTERNATIONAL BOUNDARIES.

[O. H. TITTMANN, *Commissioner*.]

UNITED STATES AND CANADA BOUNDARY.

[F. D. GRANGER.]

The survey and demarcation of the boundary between the United States and Canada through the Lake of the Woods from Northwest Angle was continued after the beginning of the fiscal year by a joint party under the charge of J. J. McArthur, D. L. S., and F. D. Granger, assistant, United States Coast and Geodetic Survey, respectively.

The Canadian party carried two schemes of triangulation across the lake, one following the boundary and the other expanding from the vicinity of American Point to cover the main portion of the lake and connect with the scheme of work brought from the west by C. H. Sinclair, of the United States Coast and Geodetic Survey. This was effected by connection with the following-named points of Mr. Sinclair's scheme, viz, Driftwood Point, Buffalo Point, Long Point, Big Point, Burton, and Oak, the last two being at the extreme southern part of the lake near Rainy River. A small scheme of triangulation was carried up Rainy River for a distance of about 12 miles to Baudette. This scheme was confined to the river banks, the average length of the triangle sides being about one-half mile. As soon as the small scheme was completed a larger scheme with sides of about 3 miles in length was begun with the line Oak-Burton for a base. This work involved the erection of high tripods and the opening of vistas through heavy timbers, as was also the case with the smaller scheme. One of the stations in the larger river scheme "Willow" was built on muskeg ground, and although given a good foundation, it was so unstable that in its occupation with a theodolite satisfactory results could not be obtained, the closure of the triangles with which it was involved proving excessive. Finally it was decided to conclude the angles at this station, as it appeared that no perceptible change in the centering of the signal occurred except when bearing the weight of the observer. The rest of the signals in this scheme were built on more stable ground and the triangle closures were satisfactory.

Fifty reference monuments were set in the Lake of the Woods to indicate the position of the boundary line and 25 in Rainy River. These reference monuments consist of a shaft of solid wrought steel, 45 inches long, 2 inches in diameter, and having a sharp pyramidal top. They were set in a bed of concrete 2 feet square and about 2½ feet deep, and wherever possible in solid rock blasted out for the purpose. Along the Rainy River, the ground being free from rock, the monuments were set in concrete as described.

With regard to the hydrography soundings were taken along the boundary line through the Lake of the Woods and up the Rainy River as far as Baudette. In the river the sounding lines were carried from shore to shore wherever it was possible to do so, and a single line was run in midstream from the mouth up.

[C. H. SINCLAIR.]

SUMMARY OF RESULTS.—Triangulation: 310 square miles of area covered, length of scheme along its axis 111 miles, 280 signal poles erected, 23 observing tripods built (heights 30 to 90 feet), 249 stations occupied for horizontal and vertical measures, 280 geographic positions determined. Azimuth: 1 station occupied for observation of azimuth. Levelling: 6 elevations (tidal bench marks) determined by levelling, 5 miles of levels run.

During the latter part of June the party that had been engaged upon the triangulation of the forty-ninth parallel and the Lake of the Woods was transferred to the vicinity of Fort Frances, Ontario, and International Falls, Minn., to take up the triangulation of Rainy River. A base had been measured near Fort Frances on June 25 and towers had been erected at East Base (87 feet in height), Squall (40 feet), and Birch (75 feet), the line between the last two furnishing a base for the triangulation of Rainy Lake by E. C. Barnard. The base near Fort Frances is 8,061.52 meters in length. Base tower was rebuilt in June after having been destroyed by a severe storm in May. The tower at East Base was blown down afterwards on August 15 but was not rebuilt, being no longer needed.

The survey of Rainy River required two schemes of triangulation: (1) A main scheme with sides from 3 to 10 miles in length of sufficient strength for bringing the work from the Warroad base and the west; (2) a subordinate scheme following the banks of the stream to locate permanent reference marks on both sides of the boundary and for the topography.

The subordinate scheme was begun by building small signals along the river below International Falls and Fort Frances, using as a base the line East Base to Digestor, 849.6 meters in length; the station Digestor being a point on the paper mill at International Falls. The main difficulty in this work was due to the necessity of confining the triangulation to the edge of the scheme as the banks are wooded except for small clearings chiefly on the Canadian side. As a rule the width of the stream determined the length of the triangle sides, but in the direction of the stream the lines were made as long as possible and the scheme was strengthened by measuring bases and connecting them with the triangulation about every 10 miles. Motor skiffs and a barge were used for transportation. In the 44 miles of river triangulation 255 stations were established. The stations were marked with bronze disks set in concrete or in holes drilled in the rocks. The work of the season terminated at Birchdale.

The main scheme of triangulation was begun near Fort Frances and International Falls, so as to give a base for the triangulation of Rainy Lake.

The reconnoissance was confined to the Canadian side where the roads were fairly good. No scaffold signals were considered necessary, as tripods properly guyed had proved successful in previous work.

When the points had been selected for a sufficient distance ahead and the towers were erected observing was begun and continued as the work progressed. Eleven signals were blown down by the storms in August, causing delay, as most of them had to be replaced.

All of the observations in the main scheme were completed by November 13, and a remeasurement was then made on November 14

and 15 to test the accuracy of the base at Warroad. The second measurement agreed closely with the first.

In the main triangulation 25 stations were used, of which 20 were towers (tripods), ranging in height from 30 to 90 feet, and one pole at Big Fork, 102 feet.

Between July 16 and August 3 an azimuth was determined at Fort Frances East Base.

[E. C. BARNARD.]

SUMMARY OF RESULTS.—Reconnaissance: Length of scheme 39 miles, 22 points selected for scheme. Triangulation: 15 observing tripods and scaffolds built with heights from 18 to 70 feet, 23 reference and triangulation signals built, 35 stations in main scheme occupied for horizontal measures, 117 stations in secondary scheme occupied for horizontal measures and 52 with plane table, 89 geographic positions determined. Leveling: 6 miles of levels run. Azimuth: 1 station occupied. Topography: 83.8 square miles of area surveyed, 550.60 miles of shore line run, 45 miles of boundary mapped. Monumenting: 86 reference points set.

Work on the survey and marking of the international boundary in the region of the Lake of the Woods, Rainy Lake, and Rainy River was in progress at the beginning of the fiscal year.

By July 1 all work had been completed on the Lake of the Woods, the triangulation on Rainy Lake was well under way, the reconnaissance having been complete as far as Brule Narrows, half way up the lake, the large scale mapping on Rainy River was one-half completed, and the topographic work on Rainy Lake was well under way.

On August 7 the large scale work on Rainy Lake being completed work was begun in Black Bay. The necessary triangulation was done in advance of the topography. On August 15 a hurricane swept over Rainy Lake and vicinity blowing down several of the triangulation signals and very nearly wrecking the launch *Amrita* used by the party.

In this month a trip was made by the chief of party through Brule Narrows, some ranges were erected, soundings taken, and the channel followed out. On August 26 an officer of the survey took up the observation of horizontal angles for the location of boundary reference marks, relieving the Canadian surveyor who had been engaged on that work.

On September 24 an American surveyor was detailed to cooperate with a Canadian party in making a reconnaissance on Lake Namakan.

With the exception of the detail map of Four-Mile Bay and the mouth of Rainy River, the topography of the Lake of the Woods, completed before the beginning of the fiscal year, was done on a scale of 1:45,000 with 10-foot contours and extending back 1 mile from the shore. The shore line was run out with much detail. A plane-table triangulation was executed on Lake of the Woods for the location of additional signals for the topography. The topography of Black Bay was executed on a scale of 1:20,000 with a contour interval of 10 feet. This bay has an area of 8 or 9 square miles and is on the south side of Rainy Lake with a narrow entrance situated about 10 miles east of the mouth of Rainy Lake. Triangulation was carried up the bay from two stations established on opposite shores of the entrance. Reference points were set at each station and their elevations determined by stadia lines from the water level of the lake, which was known, this being the base used for the ver-

tical control of the topography. This work was completed in 9 days by one observer and two assistants. During this time 8 stations were rebuilt, 5 towers and 7 topographic stations were occupied and 10 other signals and points were cut in and checked by intersection, making in all a total of 21 checked locations.

A detail map of Four-Mile Bay and the mouth of Rainy River was made on a scale of 1:20,000 with 5-foot contours; it extended back 1 mile from the shore and included the mouth of Rainy River, the islands to the northward and westward of the mouth of the river, and all of Four-Mile Bay. When this work was begun the triangulation of the lake was not completed and it was necessary to measure a base from which to develop the control for the three field sheets on which the topography was executed. This base was measured with a 100-foot steel tape along a straight sandy beach on the north side of Pine Island. Eleven signals were erected in such positions that the base could be expanded by good intersections into a small scheme of control that located the two lighthouses and tied everything to the main triangulation station Oak and the subsidiary station Perk, which, together with Zipple and Lude, were occupied with a transit instrument and the whole tied into the main scheme triangulation.

The topography of Rainy Lake from its outlet at Rainer to the eastern end of Brule Narrows, a distance of 24 miles along the boundary, was executed on a scale of 1:20,000 with a contour interval of 10 feet. Reference points were set and determined in position by a subsidiary triangulation. The marks used were bronze tablets wedged and cemented into holes drilled in the rocks. In placing the reference marks the general practice observed was to establish them on points projecting toward and nearest to the boundary and as far above the water as possible. The observing was done with a 7-inch Berger transit with the same degree of precision as in the main scheme work. During the season on Rainy Lake 68 reference marks were placed and the same number of signals erected. The number of stations occupied was 65.

In the western portion of Rainy Lake, which extends for 23 miles along the boundary, 1,200 islands were located and mapped with a total shore line, including islands and mainland, of 402 miles.

A large scale survey was made of Rainy River and adjacent towns from a point about one-half mile below the dam at International Falls to the mouth of Rainy Lake, including the towns of International Falls and Ranier on the American side and Fort Frances on the Canadian side of the boundary. The scale adopted was 1:5,000 with 5-foot contours. Vertical control was furnished by level lines which were run on both sides of the river, based on the United States Geological Survey bench mark at International Falls. A 1,100-meter base was measured with invar steel tape along the Canadian Northern Railroad in Fort Frances. A small scheme of triangulation was carried up the river and closed on two stations of the main scheme next east of the Fort Frances base. Reference marks were set on both banks of the river in such position as to control the changes in the course of the boundary. The elevations of the reference marks were determined by closed level lines. Prominent points were cut in to aid in the control of the topography. A dam built at International Falls some years previously had caused considerable areas of land to be overflowed. This made it neces-

sary to run out two shore lines, the outer or brush and marsh line and the actual water line which is often far back in the timber, the region being densely wooded.

The reconnoissance for triangulation was extended through Rainy Lake and Lake Namakan, a distance of 60 miles along the boundary, but bad weather compelled the party to leave the field before the last two towers on Lake Namakan could be constructed. The observing was completed for 30 miles. Twenty-four triangles were closed with an average closure error of 4.8 seconds.

Work was closed for the season at the end of October.

The party engaged in the survey of the international boundary line through Rainy Lake eastward from Brule Narrows and through Rainy River westward from International Falls resumed work in May, 1914. The operation of the party included also the erection of observing tripods in the scheme of triangulation laid out during the previous season to the head of Lake Namakan, with the necessary topography, establishment of boundary reference marks, and the necessary triangulation for determining the position of the reference marks.

Arrangements had been made in the latter part of April for putting the motor launches and boats used in this work in condition for service.

On May 3 a level line was run from the Canadian geodetic bench mark at Sprague to a temporary bench mark of the United States and Canada boundary survey at Sprague's lumber camp, in order to check the levels along the boundary line from Red River to the Lake of the Woods.

The completion of the topographic work in Black Bay was next taken up.

Subparties for the triangulation, signal building, topography, and location of reference marks were organized during the latter part of May.

The elevations used in the topography of Rainy Lake were taken directly from the water surface, the elevation of which was read each day on a water gauge. The zero of this gauge was determined from bench marks established on the lake during the winter of 1912-13. From May 18 to June 30 the elevation of the water of the lake increased from 1,105.3 to 1,108.1 feet.

Two members of the Canadian party at work on Lake Namakan visited the American party on Rainy Lake from June 6 to 12, inclusive, to examine the methods used in the topographic work.

I. R. Pounder, representing the Canadian commissioner, was attached to the triangulation party on Rainy Lake from June 2 and rendered valuable assistance in the subsidiary triangulation.

An azimuth was observed on the terminal line of the triangulation of Lake Namakan. Time was obtained by transportation of chronometers.

The topographic map of Rainy Lake was completed from Brule Narrows to Deers Horn Point, a distance of 7 miles along the boundary, on a scale of 1:20,000, with 10-foot contours.

The topographic map of Rainy River, on the same scale, was completed from International Falls to the mouth of Little Fork, a distance of 14 miles.

Work was in progress at the close of the fiscal year.

[W. B. FAIRFIELD.]

SUMMARY OF RESULTS.—Reconnaissance: 97 points selected for scheme. Base lines: Tertiary, 1, 1,117 meters in length. Triangulation: 17.2 square miles of area covered, 103 signal poles erected, 97 stations in main scheme occupied for horizontal measures, 73 stations occupied for vertical measures, 94 geographic positions determined, 93 elevations determined trigonometrically. Leveling: 5 miles of levels run. Azimuth: 3 azimuth stations occupied. Topography: 114 square miles of area surveyed, 337 miles of shore line of lakes and rivers run, 12 topographic sheets finished. Distance along boundary 28 miles.

Work on the survey of the portion of the international boundary line from the mouth of Pigeon River to the Lake of the Woods was begun on May 22.

The reconnaissance was extended from the line Faith-Enough of the previous season's work, just below Knife Lake Dam, to the westward covering Birch Lake. Field work was carried on continuously and as rapidly as the weather conditions would permit up to November 20, on which day the party was disbanded at Winton, Minn.

During the season between May 13 and November 4 rain fell on 57 days which kept the water in the lakes at a fair stage and prevented forest fires.

The triangulation was taken up at Knife Dam at the west end of Knife Lake, starting from the line Faith-Enough and was extended to the westward, covering Carp, Birch, and Basswood Lakes and the river below to the east end of Crooked Lake.

The topography consisting of the shore line of all the lakes, islands, rivers, and connecting streams, together with the topography of all the portages along the line, was carried along at the same time with the triangulation. The scale was 1:20,000, but all of the narrow places, rivers, small lakes, connecting streams, and portages were on a scale of 1:5,000. In all of the topography done this season 20-foot contours were run. Cache Bay, entirely in Canada and some distance from the line, had not been surveyed during the previous season, but later the shore line of this lake was run in.

The shore line of Basswood Lake was completed, including the large bays Bayley, Merriam, and North in Canada, and Wind, Hoist, and Jackfish, in Minnesota. The last extends south into Minnesota for 10 miles below the boundary and contains numerous islands.

Double zenith distances were observed at enough triangulation stations to give the elevations of nearly all stations determined.

Levels were run over the portages between Carp and Birch Lakes, Birch and Basswood, and Basswood and Fall Lakes, the last over the $4\frac{1}{2}$ mile portage from Hoist camp to Fall Lake on the railroad of the St. Croix Lumber Co.

The difference in elevation of Fall Lake and two of the bench marks of the Duluth and Iron Range Railway at Winton was also determined by leveling.

Observations for azimuth were made on two nights at each of three triangulation stations—Garb, Gyp, and Hoist.

A base line 1,117 meters in length was measured in November near Hoist Portage, between the triangulation stations Hoist and North Base. The measurement was made on the ice with an invar tape.

The triangulation stations were permanently marked with brass plates or drill holes in the rocks.

During the greater part of the season canoes were used for the transportation of the party and equipment. A motor boat was used on two occasions in moving camp, and the final move in November from Hoist Portage to Winton was made by team.

A number of soundings were made in Basswood Lake along the general position of the line as shown on the old map, the deepest was 77 feet, found in the upper part of the straight north stretch, east of United States Point. The next deepest part was at the eastern end of the lake along the line south of Bayley Bay, where the average depth was about 60 feet just west of triangulation station Had. Up to and around the turn to the north stretch the average depth is about 30 feet.

The field report of this work contains a description of the region adjacent to the boundary, the lakes, rivers, islands, rapids, falls, dams, portages, and other natural and artificial features.

Work was resumed in May on the survey of this section of the boundary beginning at Birchwood Lake, the work being extended to the westward from the work of 1913. By June 30th eight new stations had been located in the triangulation scheme, the necessary signals erected and lines cut to all other stations. Six stations had been occupied and the work was being extended toward Crooked Lake.

[J. B. BATLOR.]

SUMMARY OF RESULTS.—Boundary measurement: 35 miles, 2,545 feet of boundary measured twice with invar tapes, 20 miles of vista 30 feet wide cut through the forest. Triangulation: 2,338 feet of boundary triangulated, 6 stations occupied for horizontal measures. Leveling: 35 miles, 4,883 feet of levels run. Azimuth work: 13 azimuth stations occupied. Topography: 42.5 square miles of area covered. These statistics include work done in the spring of 1913.

Field work was resumed in May, 1913, on the Maine-Quebec boundary by the American and Canadian parties. The American party began work from the termination of the work of the previous season, west of St. Pamphile, Quebec, while the Canadian party took up the survey of the southwest branch of the St. John River, where this branch forms the international boundary line near St. Sabine, Quebec. The Canadian party undertook to continue the monumenting of the international boundary where their work of the previous season had closed, a short distance east of St. Pamphile. The American party undertook to open up and clear a 30-foot lane through the forest along the boundary from a point just west of English Lake to the point on the southwest branch of the St. John River where this branch becomes the international boundary. Work was begun on May 23 and was continued until the international boundary line was opened up, surveyed, and monumented to the southwest branch of the St. John River, connecting with the work of the Canadian party at this point. This vista-cutting party closed work on September 6 and the surveying party on September 10 excepting the measurement of some horizontal angles required west of St. Pamphile, which was completed by September 25.

During the season 35 miles, 2,545 feet, of boundary line were twice measured with invar tapes in opposite directions. The end stakes were braced in four directions owing to the marshy nature of the ground. A double line of levels was run over the tops of these stakes.

Two thousand three hundred and thirty-eight feet of boundary line were triangulated, across water areas, on the boundary line. Three invar tapes were supplied to the party, of which two were used for measuring and one was kept as a standard. Comparisons were made with the standard for about every 5 miles of the boundary. The spring balance used for measuring was compared with a spare balance kept for that purpose, before and after use, and the balance was tested while in use whenever it was thought desirable to do so.

Angles were observed for azimuth at the summits of convenient hills or ridges, pointings being made upon tripod signals upon the next hills north and south of the point occupied. Angles were measured for azimuth at 13 triangulation stations, and 6 stations were occupied in triangulation across the North West Branch.

The Canadian Government is connecting in their scheme of triangulation along the St. Lawrence Valley and around the dense forests the extreme ends of the straight lines which have been measured through the forest for about 80 miles, with invar tapes and horizontal deflection angles, by the American and Canadian parties. This triangulation, when completed, will furnish a check on the tape measurements.

A topographic survey on a scale of 1:20,000 was made of the territory immediately adjacent to the boundary.

Ten cement and 59 cast-iron monuments of the commission of 1842 were reset by the Canadian party along a portion of the international boundary line surveyed by the American party.

About 20 miles of 30-foot lane along the boundary was opened up through the forest by the American party. All trees were cut close to the ground and removed from the lane.

[JOHN E. McGRATH.]

SUMMARY OF RESULTS.—Reconnaissance: Length of scheme 13 statute miles, 15 square miles of area covered, 201 lines of intervisibility determined, 60 points selected for scheme. Base lines: 1, secondary, 612.7 meters in length. Triangulation: 15 square miles of area covered, 35 signal poles erected, 37 stations in main scheme occupied for horizontal measures, 8 stations in supplemental schemes occupied for horizontal measures, 74 geographic positions determined, 41 elevations determined trigonometrically. Topography: 3½ square miles of area surveyed, 14 miles of shore line of rivers surveyed, 1 mile of shore line of creeks surveyed, 1 topographic sheet finished.

Work was begun in June at Calais, Me., where it was intended to make arrangements with the mill operators to permit such a flow of the water impounded by dams at Woodland and Calais as would enable the commissioners to obtain conditions favorable for studying the channel surroundings about the islands between Milltown, Me., and Milltown, New Brunswick, during the period for the annual shutdown, which occurs about July 4. Owing to the unusually high stage of the river it was found however that the desired condition of the river bed could not be expected during that season.

A topographic survey on a scale of 1:10,000 was made of the valley of the St. Croix River extending from the vicinity of the large iron monument at the head of the river to station Avernus at the northern end of the survey executed by this party in the field season of 1912. This survey was controlled by the turning points in the traverse

survey executed by a Canadian party in 1912. The survey was made in such detail as to include all characteristic features of the stream necessary for definitely locating the boundary, and reference marks were placed in all localities where necessary. In addition to the survey of Monument Brook, the valley of Clendenning Brook, the principal affluent of Monument Brook, is shown for a distance of about a mile above the junction of the two streams.

The section through which the work was carried is an unbroken wilderness except for a few lumbering trails long since disused.

The permanent station marks now in position between the original iron monument at the head of the river and station Avernus are 16 in number. Eight of these are brass boundary marks set in boulders, and 8 are granite posts 3 feet in length and 8 by 8 inches square, set in concrete. The iron monument which was originally erected at the head of the St. Croix River by the commissioners appointed under the provisions of the Treaty of Washington, 1842, and which was readjusted in position and strengthened and improved by a solid and substantial concrete base in 1908, was found to be in excellent condition. A small amount of triangulation was executed for the purpose of redetermining the geographic position of this monument.

On the completion of this work the party was transferred to Eastport, Me., to locate and establish range marks in the sections of the international boundary included between the center of Grand Manan channel and the mouth of the St. Croix River. The work to be done was divided between the American party and a Canadian party. In the section assigned to the American party from Grand Manan channel to a line joining Buckman Head and Friars Head, were seven links of the boundary line beginning with boundary point No. 7 and ending with boundary point No. 14.

The work included the determination by triangulation of a large number of points which would be useful to navigators, surveyors, public officers, or others interested in ascertaining the location of the boundary. The position of at least one point on each range line was determined and marked. On four sections of the line, because of local obstructions, but one range on shore (for each) was marked, but by placing can buoys, which can be readily done, at two of the turning points of the line, the number of sections not marked by ranges will be reduced to one, and each end of this last section is on the intersection of marked cross ranges.

The range points were marked with stone cairns set in cement with the exception of three, viz, the range mark on the Lubec breakwater; the front range mark on the range line Boundary Point No. 12, Front Range, Duck triangulation station, and the range mark on prolongation of the sections Boundary Point No. 13, Boundary Point No. 12. These three points are marked by round iron rods to which vanes have been riveted. Two of the rods are set in holes drilled in rocks and the third is set in a bed of concrete.

Most of the range marks established by Commissioners Mendenhall and King were found to have been destroyed.

Field work closed on October 28.

ALASKA BOUNDARY.

[THOMAS RIGGS, Jr.]

SUMMARY OF RESULTS.—Boundary work: 210 miles of boundary covered, 35 stations occupied, 3 monuments repaired, 84 monuments inspected and numbered, 8 new monuments interpolated. Triangulation: 7 stations occupied for horizontal measures, 7 stations occupied for vertical measures, 22 monuments occupied for horizontal measures, 28 monuments occupied for vertical measures.

The operations of this party during the field season of 1913 included the inspection and numbering of the monuments between the Yukon River and Mount Natazhat; the strengthening of the positions of various monuments, and the interpolation of monuments in stretches where the distances between the existing monuments seemed too great. This work was done by a joint American and Canadian party, the British surveyor being J. D. Craig.

The party arrived at the boundary crossing of the Yukon River on June 27. Work was begun with the occupation of monument No. 111 on the north bank of the Yukon River. Until July 15 progress was much delayed by the smoky condition of the atmosphere. Heavy rains then put out most of the forest fires and laid the smoke. By that time about 40 miles of line had been gone over to Poker Creek, a tributary of Walkers Fork of Forty-Mile River and 6 monuments had been interpolated. On the 18th of July camp was moved to Sixty-Mile River. Here the pack train was divided, part going back to Glacier Creek for the remainder of the supplies which had been freighted by wagon to that point. The remaining horses freighted a full load across the high divide to the south, into the head of the North Fork of the Ladue River. Grain caches had been established during the winter on the Ladue and at Canyon City on the White River, so that it was now possible to transport almost everything without relaying except during the first week after leaving Sixty-Mile River.

While in camp on the Ladue River the first news was received of the new Chisana gold strike. Two prospectors had taken out 200 ounces of dust in a few hours on Cathenda or Johnson Creek, which is a tributary of the Chisana or Shushanna River. The result was a rush of prospectors to that region, many of them inadequately equipped. Frequent appeals for food and other necessities were made to the boundary party, and two men who had lost their way on the Jenerk and were in a starving condition were rescued by the Canadian surveyors. Many of the prospectors used the vista cut along the boundary as a trail.

From Ladue River to Scottie Creek the party traveled almost continuously through a region which had been burned over subsequent to the survey of the line. Where in previous years barely enough grass had been found to keep the horses from starving, now the hills and valleys were covered with a luxuriant growth of grass, frequently reaching as high as a horse's back.

Snag River was crossed on August 8 and the valley of the Beaver was ascended. Here much damage had been done to the trail by recent floods. Near the mouth of Baultoff Creek there was a delay of two days before the Beaver could be crossed and the monuments on the east side inspected and numbered.

On August 17 the White River was crossed and on August 19 the party moved to the head of Kletsan Creek.

On August 21 the last monument on this stretch of the work was set and numbered. This is No. 187A, which is on the last ridge of Mount Natazhat to the north crossed by the boundary. The higher ridge on which point Z of the boundary is located was so deeply covered with snow as to make the setting of a monument impracticable. The party moved back to the White River on the same day, and on August 22 concluded the field work by repairing the large monument No. 182 on the north bank of the White River. This monument had been set on frozen ground the thawing of which had partly overturned the monument.

Floods in the White River on August 23 made the return crossing dangerous, the water reaching the backs of the horses and the current being very rapid. The same night the water made a further rise of 8 feet, owing to the overflow of a lake in the Russell Glacier.

Information was received from Mr. Lambart, one of the Canadian surveyors, that all of the field work south of Mount Natazhat and as far as Mount Constantine ridge had been completed. The triangulation had been extended for two quadrilaterals beyond Mount Natazhat and the necessary data had been obtained for the plotting of phototopography. This work when finished will connect with that of the American party to the south under D. W. Eaton. After repeated attempts an ascent had been made of Mount Natazhat. Unfortunately no observations were obtained as a storm arose shortly after the summit was reached.

With the object of visiting the parties of D. W. Eaton and Asa C. Baldwin who had been surveying between the Chitina River and Mount St. Elias, Scolai Pass was crossed on August 25, but information was then received that these parties had been withdrawn and disbanded.

The trail over Scolai Pass is on the route from McCarthy, at the end of the Copper River and Northwestern Railway, to the Chisana country. The trail was thronged with prospectors, many ill-supplied with provisions and other necessities and inexperienced in camping and mountain travel. Four men had been drowned in the Nizina and Chitistone rivers. The trail was found to be dangerous in places but no more so than others encountered along the boundary.

The party left McCarthy on August 31, arriving at Cordova the same day.

The time spent in the field was 65 days, during which time 210 miles of boundary were covered, 35 stations occupied, 3 monuments repaired, 84 monuments inspected and numbered, 8 new monuments interpolated, and 9 stations occupied for magnetic declination.

The general condition of the monuments was found to be most satisfactory. A few had slipped slightly but not enough to get out of the allowable error 1 foot from the straight line between main-line points. The settings were in excellent condition and can not be moved by any ordinary means. The base of the small cone weighs about 1,500 pounds while the base of the large monument will weigh nearly twice this amount. As it now stands every monument between the Arctic coast and Mount St. Elias has a well-determined geodetic position and an elevation trigonometrically computed which

is sufficiently accurate for any engineering purpose. The numbers drilled into the metal of the monuments will positively identify them for use in connection with any future surveys, governmental or private, that may be connected with them.

The triangulation done during the season was merely to tie in the new monuments interpolated with the main scheme and to strengthen the connections at some of the existing monuments.

The party left Cordova on September 5 and arrived at Seattle on the 11th.

[D. W. EATON.]

SUMMARY OF RESULTS.—Topography: 305 square miles of area surveyed (with plane table), 600 square miles of area surveyed (by phototopographic method), 6 plane-table sheets finished.

During the season of 1913 the topography of the Chitina Valley and along the one hundred and forty-first meridian between Mount Natazhat and Mount St. Elias was completed excepting the portion from the summit between Mount Anderson and Mount Natazhat to Mount Natazhat.

The party arrived at Cordova, Alaska, on March 7, and at McCarthy on the 11, where preparations were immediately made for forwarding freight to the first camp. Field work was begun on April 25. A subparty consisting of C. V. Guerin, a cook, and two men was detailed to complete the plane-table work along the boundary across, and on either side of the Logan Glacier, and as far toward Mount St. Elias as possible. The plane-table work had been carried during the previous season as far toward Mount Natazhat as it was practicable to go. L. L. Summerlin was equipped with a phototopographic camera and detailed to accompany the party of Asa C. Baldwin to the snow fields toward Mount St. Elias. In the latter part of May D. W. Eaton began phototopographic work around the edges of the plane-table sheet worked upon by Mr. Guerin during the previous season, and extended the survey toward Mount Natazhat to connect if possible with the work of a Canadian party working in the vicinity of that mountain. He was assisted by two men. The trails that had been built along the rock slides on the sides of the mountains during the previous season had to be partly rebuilt, and it took the party until June 10 to reach the point where the Anderson Glacier enters into the Chitina Glacier. From this point the glacier could be traversed and was used as a highway until finally it also became impracticable.

The photographic work was carried up the glacier toward Mount Natazhat until further progress was prevented by the crevassed and broken condition of the glacier and the precipitous sides of the mountain. A return was then made to the foot of the glacier which was reached on July 8.

On the 11th arrangements were made for taking out the party and outfit. Mr. Guerin and Mr. Summerlin were then in the vicinity of the Logan Glacier, and reported that they would not be ready to leave for two weeks. On July 15 the journey was begun to McCarthy, distant about 100 miles, over a difficult trail. McCarthy was reached on the evening of July 25, and on the 31st the pack train was sent back for Mr. Baldwin's party and the remainder of the other

party. These arriving on August 25, the instruments and equipment worth preserving were shipped by freight to Seattle and the remainder sold, and shortly afterward both parties returned to Seattle.

During the season of 1912 a plane-table triangulation had been carried up the Anderson Glacier and a plane-table sheet completed of the glacier and of the adjacent mountain sides. In 1913 triangulation with the small phototheodolite was carried up this valley as far as Mount Anderson for the control of the phototopographic work. An attempt was made to photograph the country not already included in the plane-table work so as to extend these sheets northward toward Mount Natazhat. As further progress up the Anderson Glacier was impracticable, it was necessary to ascend peaks farther to the south and the view from these toward Mount Natazhat was cut off by an intervening ridge.

The upper Chitina Glacier was too much broken to use as a highway, and a trail had to be made along the mountain side to reach the boundary line. It was found impracticable to get to the southern side of this glacier. A station was occupied about half a mile below the boundary on the northern margin of this glacier.

Of the Logan Glacier and on Boundary Ridge along and in the vicinity of the one hundred and forty-first meridian a plane-table sheet was made on a scale of 1:45,000. This sheet was extended in the direction of the upper end of Logan Glacier as far as the control from the triangulation stations would permit. It was not found practicable to extend the plane-table work for any great distance north and south. The area between the plane-table sheets and Mount St. Elias was covered by phototopographic work done in cooperation with a Canadian party, and depending on the triangulation toward Mount St. Elias.

Results obtained with the plane table and camera will be plotted from Mount St. Elias northward to latitude 61 degrees 15 minutes north, or to the summit between Mount Anderson and Mount Natazhat.

[ASA C. BALDWIN.]

SUMMARY OF RESULTS.—Triangulation: 200 square miles of area covered. Length of triangulation along axis of main scheme, 35 miles, 1 base line measured, 22 signals built, 24 stations occupied for horizontal and vertical measures, 3 camera stations occupied, 30 secondary points determined. Azimuth: 1 azimuth measured. Monuments: 3 monuments set.

During the field season of 1912 the triangulation of the region north of Mount St. Elias had been extended from the head of White River to the Chitina River. Instructions for the season of 1913 directed that the triangulation should be carried from the Chitina River to the one hundred and forty-first meridian, and that a base should be measured at some point as near the boundary as possible and connected with the triangulation.

It was arranged that a representative of the British commissioner should cooperate with the American party in the location of such monuments as should be established on the boundary. It was directed that upon the establishment of a point on the boundary a meridian should be determined by the azimuth carried forward through the triangulation, and also that the astronomic azimuth of some line of the triangulation near the boundary should be deter-

mined as a check upon any large error that might occur in the triangulation or computations. It was also planned that Mount St. Elias should be connected by triangulation with the boundary as located, and that if practicable an ascent should be made of Mount St. Elias from the north for the purpose of laying off topographically a suitable course for the boundary line from the summit to its intersection with the one hundred and forty-first meridian.

Field work was begun on April 24. The triangulation was taken up where it ended in 1912 in the Chitina Valley about 30 miles west of the one hundred and forty-first meridian, and was extended up the river to and across the Chitina Glacier and up the Logan Glacier as far as the boundary line.

A base line 1,799.3852 meters in length was measured on the gravel bar near the foot of the Chitina Glacier, and the triangulation was connected with it.

The azimuth of the line Terminus to Finis was determined, and observations were also made for astronomic azimuth. In establishing the one hundred and forty-first meridian the azimuth carried through the triangulation was used, not the astronomic azimuth.

Three 30-inch cone-shaped monuments were set during the season. No. 189 is located at an elevation of 8,900 feet on the mountain between the Logan and Walsh Glaciers; No. 190 on the north side of the Logan Glacier and about 1,000 feet above it; and No. 191, the last and most southerly permanent mark on the one hundred and forty-first meridian, is on the south side of the Logan Glacier. Nos. 189 and 191 were well set in protected positions. No. 190 could not be satisfactorily set on account of the steepness of the slopes and the crumbly character of the rock. No other sites than the above could be located.

Three stations near Mount St. Elias were occupied with the phototopographic camera.

Mount St. Elias was connected with the triangulation. As compared with former determinations from the coast, there was a difference of 7.29 seconds in latitude and 2.21 seconds in longitude, and the computed elevation of the mountain was 18,008 feet, or 16 feet lower than the previous determination of 18,024 feet.

The party crossed the snow fields north of Mount St. Elias and reached an elevation of 16,400 feet on the shoulder of that mountain. The further ascent of the mountain offered no difficulty, and would in all probability have been accomplished but for a storm which lasted three days and made further progress impracticable.

From the valley of the Chitina Mount Logan appeared as a massive mountain with three domes. These domes were several miles broad, and no definite point could be sighted from the triangulation station. The observed elevation of this mountain was more than 1,000 feet less than that determined from the coast. It is probable, however, that the summit was not visible from the position occupied.

A few miles west of Mount Logan is a high isolated peak which was first discovered by the survey party in 1912. At the suggestion of the United States commissioner this mountain was called Mount King, in honor of the British commissioner, Dr. W. F. King.

Expedition to Mount St. Elias.—Mount St. Elias was discovered and named July 20, 1741, by Vitus Bering, a Russian navigator.

Its geographical position and elevation have been determined on various occasions with more or less accuracy, but the ascent to the summit has been made but once, by the party of the Duke D'Abruzzi in 1897.

Over the region to the northward of this mountain passes the one hundred and forty-first meridian from Mount Natazhat. It strikes the St. Elias range west of the summit. According to the treaty the line from the summit to the one hundred and forty-first meridian shall be parallel to the coast line. It was for the purpose of determining the topography of the St. Elias range so that this line could be laid off topographically that the survey party entered the St. Elias region.

The party consisted of the American surveyor and four men and the Canadian surveyor with one man, making a total of seven. Four additional men accompanied the party to the first divide, and then returned to the vicinity of the Logan Glacier, two of them to build the remainder of the triangulation signals and place the monuments, cement, and sand at the monument sites. The other two men also turned back after reaching the first divide, having occupied camera stations on the way.

The equipment and instruments were selected to meet the conditions of glacier travel and were of the least possible weight. Provisions for one month were carried. For transportation two 7-foot Yukon sleds, drawn by the men, were used. An average load of 100 pounds to the man was carried on the sleds.

On June 14 the summit of the intervening ridge, a 10,000-foot peak, was reached, from which Mount St. Elias could be plainly distinguished towering nearly 11,000 feet above the level of a valley to the southwestward.

The original plan had been to ascend the mountain from the northeast, but upon examination the route from the westward was found to be the shortest and only slightly steeper than that from the north, and it was therefore adopted. On June 17 the summit of the divide between the Logan and Columbus glaciers was crossed at an elevation of 9,000 feet, and a descent was made into the snow fields north of St. Elias. By June 22 the base of Mount St. Elias was reached, and the weather, which had previously been clear, became less favorable and a thick fog settled over the peaks. Camp was now at an elevation of 7,500 feet. The west face of Mount St. Elias proving impracticable, an examination was made on June 23 of a steep glacier that led to a saddle 12,000 feet high. From this saddle a south slope was discovered by which the ascent to the high shoulder appeared practicable. On June 28 camp was pitched at an elevation of 13,500 feet. From this camp looking to the southward could be seen the great Malaspina Glacier and beyond it the Pacific.

To the northeastward the west shoulder of Mount St. Elias rose abruptly for 3,000 feet, while a short distance to the westward stood the terminal cone of Mount St. Elias, 1,000 feet higher and distant 3 miles.

The final ascent was begun at midnight on June 29. Snow begun to fall almost immediately, and it was midnight of the next day

before the sky cleared. The ascent was begun at about 1 a. m. on June 30, each man carrying a pack weighing about 20 pounds, consisting of the instruments, food, and necessary clothing.

After nine hours of difficult climbing, and when within a few hundred feet of the top of the west shoulder, from which to the summit of the mountain was a gradual slope presenting no obstacles, a heavy storm set in which would have prevented instrumental work even if the summit had been reached, and very reluctantly the party turned back when at an elevation of a little over 16,000 feet. Camp was reached on the return at 5 o'clock in the afternoon, and as the provisions were becoming low, three men were sent back to the base camp. On July 3 snow was still falling and the provisions were almost exhausted and all idea of a further ascent of the mountain was abandoned. About 3 a. m. the clouds lifted sufficiently to permit the occupation of a camera station, after which preparations were made for the return journey.

In going down it was found necessary to jump over a deep crevasse 8 feet in width. On July 4 the return was continued from the base camp toward the timber line and the main cache. A thick fog was hanging over the snow fields on July 5, but it was necessary to continue. On the fourth day the Logan Glacier was reached, and a wood fire was made for the first time in 30 days. On that evening some of the party started for the main camp across the Logan Glacier and the remainder followed the next day.

The return journey to the coast was made without special incident, and after attending to necessary details and making proper disposition of the instruments and equipment the party sailed from Cordova, Alaska, for Seattle, Wash., on September 28, arriving at the latter place on October 3.

[FREMONT MORSE.]

In April an officer of the Coast and Geodetic Survey was instructed to join the Canadian party under N. J. Ogilvie to act as a representative of the United States commissioner in the marking of the boundary in Portland Canal and Dixon Entrance.

Field work was begun in May in the vicinity of Wales Island and from a camp in Sitklan Island.

The plan of operations for the season included first, the continuation of the triangulation down Pearse Canal from the termination of the work of the previous season to a junction with the Coast and Geodetic Survey triangulation at the east end of Dixon Entrance; second, a primary scheme of triangulation through Dixon Entrance to Cape Muzon and North Island; third, the reoccupation for phototopography of some of the stations of the preceding year, at which the photographs taken were not successful; fourth, a visit to the site of Monument D on the ridge between the Bear River and Salmon River valleys, to see if the monument was still in position; fifth, a test of the alignment of the first monument up the ridge between Eagle Point Monument and Monument D; and, sixth, the establishment of a monument on the boundary line on the south bank of the Stikine River.

At the close of the season's work of 1912 the triangulation of Pearse Canal had terminated at the quadrilateral Twenty-Eight, Twenty-Nine, Thirty, and Thirty-One. The first two of these sta-

tions had been occupied and on the others signals had been erected and observed upon.

For carrying the work to a connection with the Coast and Geodetic Survey triangulation a new station, Mount Des Brisay, on Wales Island, was taken into the scheme to form a quadrilateral with Twenty-Eight, Thirty, and Thirty-One. Through a chain of four quadrilaterals a connection was made with the old Coast and Geodetic Survey stations Boston, Garnet, and Whitley. From the stations of this triangulation, together with one or two subsidiary stations, reference marks were located at U. S. 5, C. 5, U. S. 4, C. 4, U. S. 3, C. 3, U. S. 1 and 2, C. 2 and C. 1. These names indicate the approximate location of the monuments. Monuments of concrete identical in size and shape with those placed during the season of 1912 were established at the above-named points.

For the primary triangulation of Dixon Entrance an observing party was sent to Cape Muzon to begin work near the ocean and proceed to the eastward. The weather was extremely unfavorable for observing and during the season from May to September only two stations were completed, Cape Muzon and North Island. The observations at Cape Chacon were partly completed when there occurred on the night of Sept. 7-8 an unfortunate accident which resulted in the death of two signal men at the Cape Muzon station. A heavy storm and rainfall came on at night and an immense land slide overwhelmed and buried the camp in which the men were located.

In June a joint examination by the American and the Canadian officers was made of the islets off Cape Muzon and the passages between them for the purpose of securing data from which the commissioners could decide on the location for the initial monument "A" of the boundary. Sounding and photographs were obtained and a joint report was submitted.

Photographs were taken at the stations on the canal at which the pictures taken the year before had proved unsatisfactory.

Monument "D" was visited and found to be undisturbed. Photographs were taken of it from different viewpoints.

The alignment of the first monument up the ridge between Eagle Point Monument and Monument D was tested and found to be correct.

A monument was set on the south bank of the Stikine River, a short distance from the shore in line with two monuments on the opposite shore established by the American surveyor in 1904.

Work was closed for the season on September 26.

DETAILS OF OFFICE OPERATIONS.

The assistant in charge of the Coast and Geodetic Survey office has direct supervision of the work of the office. The miscellaneous section and the tidal research section are under his immediate direction.

COMPUTING DIVISION.

The most important work completed or in progress in the computing division during the fiscal year is as follows:

The preparation for publication of the results of the fourth general adjustment of the precise level net of the United States; the

preparation for publication of the results of the one hundred and fourth meridian and thirty-ninth parallel triangulations; the preparation for publication of the results of a line of levels between San Francisco and Brigham, Utah; proof reading of special publications Nos. 16, 17, and 18; the computation and adjustment of the triangulation on the one hundred and fourth meridian and that part of the thirty-ninth parallel in Colorado, Utah, and Nevada; the computation and adjustment of triangulation on the coast of North Carolina and in Pamlico and Albemarle Sounds; the computation and adjustment of the primary triangulation which extends from Alice, Tex., southward to the Rio Grande; the computation and adjustment of the triangulation on the one hundred and forty-first meridian boundary of Alaska; the computation and adjustment of the triangulation on the international boundary along the forty-ninth parallel between the summit of the Rocky Mountains and Lake of the Woods; the computation and adjustment of the triangulation on the water boundary between the United States and Canada to the eastward of the Lake of the Woods; the computations and adjustment of the observations made for the determination of the astronomic latitude at a number of points on the one hundred and fourth meridian.

The completion of the triangulation extending to the Canadian boundary along the one hundred and fourth meridian made it possible to place the geographic positions of the triangulation stations along the forty-ninth parallel, which control the boundary surveys, on the North American datum.

A number of other pieces of work were completed or in progress during the year.

The use of the photostat was continued for copying information from the files for the use of field parties of the Survey, other bureaus and departments, private individuals, and corporations. The amount of photostat work was very much greater than for any previous year. The use of the photostat has saved much clerical work, besides the advantage of greater rapidity and absolute accuracy.

Three publications giving results of triangulation and leveling were received from the printer during the year. These are listed under the head of "Publications," in another part of this report. Manuscript has been prepared for two other publications, one giving triangulation results and the other the results of precise leveling.

DIVISION OF TERRESTRIAL MAGNETISM.

The chief of this division prepared programmes and instructions for all magnetic work and attended to the correspondence of the division. He reviewed the estimates for magnetic work and directed the preparation of the results for publication. He also at times acted as assistant in charge of the office and as inspector of hydrography and topography during temporary absences of those officers.

The statistics of correspondence during the year show that the demand for information, especially concerning magnetic declination, was greater than for any previous year except 1912.

The revision of field observations on land and sea was kept up to date, including the field work in the Philippines, Hawaii, and Alaska.

The results of field observations on land and sea in the United States and outlying territories for the calendar year 1913 were prepared for publication as Special Publication No. 20. In this publication, as with the preceding one, the method of publishing the field results by the calendar year instead of the fiscal year has been followed advantageously.

Manuscripts were prepared and submitted for publication of observatory results at Honolulu, Hawaii; Sitka, Alaska; Vieques, P. R.; and Tucson, Ariz., and proof was read of four publications.

Magnetic information was furnished to Dr. van Everdingen, De Bilt, Netherlands, in accordance with a request from the International Commission for Terrestrial Magnetism, and to Dr. G. Angenheister, of Gottingen, Germany.

Copies of the tabulation of earthquakes recorded at the five magnetic observatories of the Survey were furnished for the use of the International Seismological Association, and to the Dominion Observatory, Ottawa, Canada. A copy of the Honolulu register was sent to the secretary of the seismological committee of the British Association.

Material was collected, tabulated and reduced for an isogonic chart of the West Indies, and the chart was prepared and published.

The work of tabulating the magnetic results has been much facilitated by the introduction of a specially constructed motor-driven adding machine, which not only performs the required summations but also, by an automatic change, enables figures to be printed on the tabulation sheets that heretofore required to be typewritten.

With a view to making special magnetic observations at the time of the solar eclipse of August 21, 1914, the times of beginning and ending of the eclipse were computed for Cheltenham, Md., and Bangor, Me.

The reduction of observations at the magnetic observatories was continued.

Quarterly reports of magnetic storms were supplied to the Journal of Terrestrial Magnetism for publication.

TIDAL DIVISION.

The work of the tidal division during the year includes the preparation for annual publication of the general tide tables, with separate reprints of the portions relating to the Atlantic and Pacific coasts, the preparation of information relating to the time and height of tides, in reply to a large number of requests from field offices of the Survey, other officers of the Government, and from individuals; the preparation of descriptions of bench marks, furnishing data for planes of reference, tide reducers and reduced soundings, and tide notes for charts and original sheets. Harmonic analyses were completed for two stations, for one year each, and summations were made for an analysis of two other stations. Nonharmonic reductions were made for 135 stations, with a combined length of 39 years and 5 months; mean sea level was computed for 56 stations, with a combined length of 18 years and 6 months; tabulations of high and low waters and hourly heights of the sea were made for 278 stations, with a combined length of 47 years, 10 months, and 13

days; monthly means and extremes were tabulated for 19 stations, with a combined length of 63 years and 6 months; 344 volumes of soundings, involving the computation of the plane of reference for 120 stations were reduced, and the many thousand of tide reducers were entered; and the registering, indexing, and filing of tidal records, tabulations, and reductions, and the necessary correspondence were attended to.

Additional observations of tides have been received from the Corps of Engineers, United States Army, the Hawaiian government survey, and from the Government of Cuba.

Tidal information was exchanged with the Imperial Hydrographic Office at Wilhelmshaven, Germany, and at the request of the Government of Western Australia copies of tidal predictions were furnished for Freemantle, Australia, for the year 1914.

TIDE STATIONS IN THE UNITED STATES AND INSULAR POSSESSIONS, ALASKA, CANAL ZONE, MEXICO, AND WEST INDIES FOR WHICH THE COAST AND GEODETIC SURVEY HAS ONE YEAR OR MORE OF CONTINUOUS RECORD.

| | Years. | | Years. |
|--|--------|------------------------------|--------|
| Eastport, Me..... | 2 | Key West, Fla..... | *1 |
| Portland, Me..... | *2 | Tortugas, Fla..... | 2 |
| Pulpit Harbor, Me..... | 3 | Charlotte Harbor, Fla..... | 1 |
| Boston, Mass..... | *3 | Egmont Keys, Fla..... | 1 |
| Newport, R. I..... | *1 | Cedar Keys, Fla..... | 1 |
| Bristol, R. I..... | 1 | St. Marks, Fla..... | 1 |
| Providence, R. I..... | 2 | St. Vincent Island, Fla..... | 1 |
| Block Island, R. I..... | 1 | Pensacola, Fla..... | 1 |
| New London, Conn..... | *1 | Mobile Point, Ala..... | 2 |
| Willets Point, N. Y..... | *2 | Biloxi, Miss..... | 1 |
| Fort Hamilton, N. Y..... | 3 | Cat Island, Miss..... | 1 |
| Governors Island, N. Y..... | *3 | Port Eads, La..... | 1 |
| Sandy Hook, N. J..... | *3 | Weeks Island, La..... | 2 |
| Atlantic City, N. J..... | 1 | Galveston, Tex..... | *2 |
| Reedy Island, Del..... | 2 | Fort Point, Tex..... | 2 |
| Philadelphia, Pa..... | *3 | Morgans Point, Tex..... | 1 |
| Fort Carroll, Md..... | 2 | Nassau, New Providence..... | 1 |
| Baltimore, Md..... | *3 | Havana, Cuba..... | 1 |
| Washington, D. C..... | *3 | Colon, Canal Zone..... | 2 |
| Colonial Beach, Va..... | 2 | Balboa, Canal Zone..... | 2 |
| Alexandria, Va..... | 1 | Naos Island, Canal Zone..... | 2 |
| Tappahannock, Va..... | 1 | San Diego, Cal..... | *3 |
| Old Point Comfort, Va..... | *3 | San Francisco, Cal..... | *3 |
| Richmond, Va..... | 1 | Sausalito, Cal..... | 3 |
| Wilmington, N. C..... | 2 | Astoria, Oreg..... | *3 |
| North Island Light, Winyah Bay, S. C..... | 2 | Port Townsend, Wash..... | *2 |
| Fort Sumter, S. C..... | 3 | Bremerton, Wash..... | 1 |
| Charleston, S. C..... | *3 | Seattle, Wash..... | 3 |
| Port Royal, S. C..... | 1 | Juneau, Alaska..... | 1 |
| Tybee Island, Savannah Entrance, Ga..... | 1 | Skagway, Alaska..... | 2 |
| Fort Clinch, Fla..... | 1 | Sitka, Alaska..... | *1 |
| Fernandina, Fla..... | *3 | Kodiak, Alaska..... | *2 |
| Mayport, St. Johns River, Fla..... | 2 | Hilo, P. I..... | 2 |
| St. Augustine, Fla..... | 1 | Cebu, P. I..... | 2 |
| Cape Florida, Fla..... | 1 | Corregidor Island, P. I..... | 1 |
| Indian Key, Fla..... | 1 | Manila, P. I..... | *3 |
| | | Grande Island, P. I..... | 1 |
| | | Honolulu, Hawaii..... | *3 |

* Daily predictions for port given in annual Tide Tables.

CHART CONSTRUCTION DIVISION.

The principal feature of the work of the year in the drawing section has been the increase in the quantity of original hydrographic work of a complex character to be plotted. The plotting of the wire-drag field sheets, on account of their intricacy, is particularly slow, and the hydrographic work of the past two seasons in Alaska has been of such a detailed character that progress in plotting was likewise slow.

To meet the demand for immediate results from late surveys in Alaska, preliminary charts have been prepared on vellum, printed by the Vandyke paper process, and the requisite number of copies issued to the inspector at Seattle for distribution.

In the engraving section, besides the new charts on scales of 1:400,000 and 1:200,000 which are being engraved, the 1:80,000 charts of the coast of Maine will be engraved. The greater number of ledges and details along this coast are best represented by the sharper prints from an engraved copper plate.

In order to make an advance both in quality of prints and in rapidity of printing, new offset presses are needed in the printing section.

The "direct process," by which a photoprint is made on a sensitized aluminum plate from the chart drawing, replacing the glass negatives and prints on transfer paper, promises to be the sole method employed in the future. To carry on this method conveniently a pneumatic printing frame should be provided, and to be independent of the sun an additional open arc electric lamp will be required.

The photograph section is in need of a new floor surface and ventilating fans in the bromide enlargement dark room.

The statistics for the year are as follows:

CHART PREPARATION.

| | |
|---|----|
| Schemes approved for new charts..... | 20 |
| Approved schemes on hand, charts not started..... | 4 |
| Drawings for new charts finished..... | 18 |
| Drawings for new charts in hand..... | 16 |
| New drawings for new editions finished..... | 7 |
| Extensive corrections finished..... | 87 |
| Extensive corrections in hand..... | 9 |
| Chart drawings from Manila for new charts finished..... | 8 |
| Chart drawings from Manila for new editions finished..... | 10 |
| Various miscellaneous drawings and tracings..... | |

ENGRAVING.

| | |
|---|--------|
| New plates for new charts finished..... | 6 |
| New plates for new charts in hand..... | 7 |
| New bassos for new editions finished..... | 18 |
| New bassos for new editions in hand..... | 13 |
| New bassos for reissues finished..... | 16 |
| New bassos for reissues in hand..... | 15 |
| New editions using current plate finished..... | 14 |
| New editions using current plate in hand..... | 6 |
| Extensive corrections applied to plates..... | 239 |
| Extensive corrections in hand..... | 9 |
| Miscellaneous plates engraved or corrected..... | 11 |
| Minor corrections applied to plates..... | 1, 198 |
| Charts in engraving section, engraving not started..... | 2 |

PRINTING.

| | |
|---|----------------|
| New subjects printed from aluminum plates..... | 90 |
| Reprints printed from aluminum plates..... | 93 |
| Reprints printed from stones..... | 2 |
| Total number of different lithograph charts printed..... | 185 |
| Different engraved charts printed..... | 778 |
| Miscellaneous lithographic publications..... | 12 |
| Copies of lithograph charts printed and delivered..... | 62,856 |
| Copies of engraved charts printed and delivered..... | 80,812 |
| Miscellaneous lithographic prints..... | 30,962 |
| Total..... | 174,680 |
| Lithographic impressions (all work)..... | 213,573 |
| Engraved impressions (all work)..... | 88,107 |
| Total..... | 301,680 |

ELECTROTYPING.

| | |
|---|------------|
| Altos completed..... | 60 |
| Bassos completed..... | 45 |
| Total..... | 105 |
| Number of pounds of copper deposited..... | 3,936 |

PHOTOGRAPHING.

| | |
|--|--------|
| Glass negatives made..... | 1,184 |
| Paper negatives made..... | 30 |
| Velox prints made..... | 1,903 |
| Vandyke prints made..... | 244 |
| Bromide prints made..... | 317 |
| Blue prints made..... | 1,937 |
| Photostat prints made..... | 11,881 |
| Lantern slides made..... | 11 |
| Matrices made..... | 101 |
| Prints mounted..... | 19 |
| Negatives developed..... | 0 |
| Photolithographic negatives, number of charts..... | 52 |

CHART DIVISION.

The regular work of this division has been kept up during the year. Seven employees from other divisions have been detailed at different times during the year to aid in the work of the chart division, amounting in the aggregate to the services of two additional employees for the year. Without such aid the force attached to this division would be unable to keep the work up to date.

The total issue of charts for the year was 117,492, or a decrease of 26,202 from the previous year. The issue of Coast Pilots was 5,374 and of Tide Tables, Atlantic Coast, 2,150, Pacific Coast, 11,693, general, 1,388. The issue of the Tide Tables does not represent the demand, as, owing to the early exhaustion of the editions published, the office was unable to supply all orders during a portion of the year.

In addition to the Charts, Coast Pilots, and Tide Tables, the following publications were received during the year:

| | | | |
|---|-----|---|-----|
| Index maps, Maryland oyster charts..... | 216 | Supplement to Coast Pilot, Part IV, for 1915..... | 700 |
| Isogonic Chart of West Indies... | 228 | Philippine Island maps..... | 236 |

The following Coast Pilots were issued during the year:

| | | | |
|--------------------|--------|-------------------------------|--------|
| Part I-II | 272 | California, Oregon, and Wash- | |
| Part III | 369 | ington | 407 |
| Part IV | 573 | Alaska | 413 |
| Part V | 370 | California, Oregon, and Wash- | |
| Part VI | 582 | ington, 1889 | 1 |
| Section D | 786 | Alaska, one each 1869, 1883, | |
| Part VIII | 330 | 1891, and 1901 | 4 |
| Inside Route Pilot | 1, 221 | | |
| Porto Rico | 46 | Total | 5, 374 |

The following Tide Tables were issued during the year:

| Atlantic coast: | Pacific coast: | General: * |
|-----------------|----------------|------------|
| 1908 | 1907 | 1910 |
| 1909 | 1909 | 1911 |
| 1910 | 1910 | 1912 |
| 1911 | 1911 | 1913 |
| 1912 | 1912 | 1914 |
| 1913 | 1913 | 1915 |
| 1914 | 1914 | Total |
| 1915 | 1915 | |
| Total | Total | |

Charts were issued as follows:

| | | | |
|------------------------------------|---------|--------------------------|----------|
| Sales agents | 53, 139 | Suboffice, Manila, P. I. | 7, 460 |
| Sales by office and chart division | 3, 085 | Executive departments | 7, 486 |
| Congressional account | 3, 720 | Foreign governments | 1, 521 |
| Hydrographic Office | 29, 343 | Miscellaneous | 1, 702 |
| Bureau of Lighthouses | 4, 344 | Total | 117, 492 |
| Coast and Geodetic Survey | 5, 692 | | |

Charts were issued at the suboffice, Manila, P. I., as follows:

| | | | |
|--|--------|--|--------|
| Sales agents | 1, 237 | Executive departments (other than above) | 1, 164 |
| Sales by office | 1, 527 | Miscellaneous | 127 |
| Hydrographic Office, Navy | 485 | Total | 5, 371 |
| Coast and Geodetic Survey office, Manila, and Survey vessels | 301 | | |

There were issued of the Catalogue of Charts, Coast Pilots, and Tide Tables, 735 copies; of the Maryland oyster charts, 7,067 copies; of the index to Maryland oyster charts, 60 copies; and of the Philippine maps, 368 copies.

INSTRUMENT DIVISION.

The annual report of the chief of the instrument division gives details of work accomplished in that division during the year, including the general office work, the instrument shop and the carpenter shop.

The work of accounting for instruments, general property, and furniture has been attended to as heretofore, and in addition, the necessary correspondence of the division has been kept up.

The scientific part of the work in designing and constructing new instruments, apparatus, and various kinds of special experiments, with a view to improving apparatus or methods of construction, has been conducted as usual.

* The title "General Tide Tables" was adopted with the 1915 edition.

The making and repairing of furniture, repairs to office buildings, packing and unpacking instruments and general property issued or received, and other special duties in connection therewith have been carefully attended to.

A general inventory of stock was taken prior to the sale of old instruments and material on October 31, 1913.

LIBRARY AND ARCHIVES.

The chief of the division of library and archives has charge of the general reference library maintained by the Survey and also the custody of the original sheets and field records.

During the year 700 books and pamphlets of no further use to the Survey were sent to the Library of Congress or to bureaus of the Department of Commerce. Fifteen hundred books and pamphlets were turned over to the Superintendent of Documents. The maps and charts were examined with a view to the elimination of useless items and 3,000 items were discarded. The maps were turned over to the Library of Congress and the charts sold as waste paper. The card catalogue of maps was revised.

The library contains a large collection of maps of the principal countries of the world. The collection of maps of Alaska is large, being particularly strong in chart and boundary material. There is a good collection of Philippine and Hawaiian maps.

STATISTICS OF ACCESSIONS.

| Classification. | Purchased. | Donated. | Exchanged. | Total. |
|------------------------------------|------------|----------|------------|--------|
| Books and pamphlets..... | 161 | ..... | 531 | 692 |
| Maps, charts, and blue prints..... | ..... | ..... | 982 | 982 |

ARCHIVES ACCESSIONS.

| Subject. | Volumes. | Cahiers. | Sheets. | Miscellaneous. |
|----------------------------------|--------------|------------|------------|----------------|
| Astronomy: | | | | |
| Observations..... | 8 | 9 | ..... | 1 |
| Computations— | | | | |
| Field..... | 6 | 27 | ..... |  |
| Office..... | ..... | 3 | ..... |  |
| Geodesy: | | | | |
| Observations..... | 121 | 74 | ..... |  |
| Computations— | | | | |
| Field..... | 11 | 99 | ..... |  |
| Office..... | ..... | 18 | ..... |  |
| Hypsometry: | | | | |
| Observations..... | 11 | 20 | ..... |  |
| Computations— | | | | |
| Field..... | ..... | 1 | ..... |  |
| Office..... | 5 | ..... | ..... |  |
| Surveys: | | | | |
| Soundings..... | 693 | ..... | ..... |  |
| Sheets— | | | | |
| Hydrographic..... | ..... | ..... | 127 | |
| Topographic..... | ..... | ..... | 48 | |
| Tides: | | | | |
| Currents..... | 177 | 21 | ..... | 175 |
| Levels..... | 39 | 7 | ..... |  |
| Topographic miscellany..... | 7 | 1 | ..... |  |
| Hydrographic miscellany..... | 7 | ..... | ..... |  |
| Views: Negatives and prints..... | 194 | ..... | ..... | 199 |
| Total..... | 1,279 | 280 | 175 | 375 |

TIDAL RESEARCH SECTION.

The reduction and tabulation of current observations taken on board light vessels of the third lighthouse district were continued.

The analysis of tides at Gauss Station, Antarctic Continent, extending from June 27 to December 26, 1892, was completed, the period analyzed being 162½ days. A first reduction of high and low waters was also made.

A harmonic analysis was made of tides observed at Campbell Island, South Pacific Ocean, in 1874, and a first reduction of high and low waters covering a period of 80 days was also made. A harmonic analysis was made for St. Paul Island, Indian Ocean, from observations in 1874, and other work was done in connection with tides in the Southern Hemisphere.

Examination was made of tidal and tidal-current observations for the Gulf of Mexico eastward of the Mississippi Delta.

Current predictions were made for Seymour Narrows, British Columbia, and Sergius Narrows, Alaska, for publication in the annual Tide Tables for 1915. In connection with the Seymour Narrows predictions, the harmonic constants for Port Simpson, British Columbia were examined, and tide predictions were made from them for the year 1915.

Some work was done upon the tidal currents in the Gulf of Panama and around the Hawaiian Islands.

The annual fluctuations in the sea level along the South Atlantic Gulf and Caribbean coasts were considered in reference to their bearing upon the flow of the Gulf Stream, and a memorandum was prepared in regard to the proposed determination of difference of level between St. Augustine and Cedar Keys, Fla.

Information was furnished in reply to many requests from sources outside the Survey on technical subjects relating to the tides, currents, effect of winds, height of waves, temperatures, densities, and similar matters.

MISCELLANEOUS SECTION.

During the year the chief of this section represented the Department of Commerce on the General Supply Committee, a duty which occupied about half his time.

This section attends to the purchase and distribution of supplies and keeps the accounts relating thereto, makes requisitions for printing and binding, issues stationery to field parties and office divisions, audits accounts payable from the appropriation for "Office expenses," conducts the correspondence relating thereto, and performs various other miscellaneous duties.

Respectfully,

O. H. TITTMANN,
Superintendent.

To Hon. WILLIAM C. REDFIELD,
Secretary of Commerce.

REPORT
OF THE
SUPERVISING INSPECTOR GENERAL, STEAMBOAT
INSPECTION SERVICE

691

REPORT

OF THE

SUPERVISING INSPECTOR GENERAL

STEAMBOAT-INSPECTION SERVICE.

DEPARTMENT OF COMMERCE,
STEAMBOAT-INSPECTION SERVICE,
Washington, September 11, 1914.

SIR: Herewith is submitted the report of the operations of the Steamboat-Inspection Service for the fiscal year ended June 30, 1914, as required by section 4403, Revised Statutes, and Department regulations relating thereto.

ORGANIZATION.

The following positions were embraced in the Steamboat-Inspection Service at the close of business June 30, 1914:

| | |
|--|-----|
| At Washington, D. C.: | |
| Supervising Inspector General..... | 1 |
| Chief clerk (who is Acting Supervising Inspector General in the absence of that officer)..... | 1 |
| Clerks..... | 6 |
| Messenger..... | 1 |
| In the service at large: | |
| Supervising inspectors..... | 10 |
| Local inspectors of hulls..... | 47 |
| Local inspectors of boilers..... | 47 |
| Assistant inspectors of hulls..... | 41 |
| Assistant inspectors of boilers..... | 42 |
| Clerks to boards of local inspectors (including one temporary appointment expiring at close of June 30, 1914)..... | 70 |
| Total..... | 268 |

Three permanent positions (local inspector of hulls, local inspector of boilers, and clerk at Los Angeles, Cal.) were added to the Service during the year.

SUMMARY OF OFFICE WORK.

The following is a summary of the work of the Office of the Supervising Inspector General for the fiscal year ended June 30, 1914:

| | |
|--|---------|
| Copies of circular letters issued..... | 101,435 |
| Excursion permits reported issued..... | 396 |
| Permits to use oil as fuel on steamers..... | 85 |
| Miscellaneous accounts examined and approved..... | 1,070 |
| Index (card system) correspondence, new numbers..... | 6,300 |
| Estimated number of letters answered..... | 25,000 |

| | |
|--|---------|
| Personal-expense accounts examined and approved..... | 2, 075 |
| Daily reports of inspectors examined and approved..... | 18, 200 |
| Returns of expendable property received, examined, and approved..... | 354 |
| Requisitions for supplies, printed stationery, and blank forms received, examined, and approved..... | 558 |
| Reports of casualties and violations of law recorded and filed..... | 2, 094 |
| Special reports on casualties prepared and submitted to the Secretary of Commerce..... | 687 |
| Statements of public nonexpendable property charged to the Service received, examined, and filed..... | 118 |
| Reports of tests of material at mills and affidavits of boiler makers received, recorded, and filed..... | 1, 212 |
| Reports examined of life preservers inspected at factory..... | 275 |
| License cards received, examined, and filed..... | 25, 853 |
| Vessel-inspection cards received, examined, and filed..... | 20, 000 |
| Reports of absences received, examined, and filed..... | 594 |
| Reports of circular letters acknowledged, received, examined, and filed.... | 702 |
| Reports of passengers carried, received, examined, and filed..... | 4, 400 |

EXPENDITURES.

The following is a detailed account of the expenditures for the fiscal year ended June 30, 1914:

| | |
|---|---------------------|
| Salaries, Supervising Inspector General, supervising and local inspectors, assistant inspectors, and clerks to local boards, authorized by acts of Congress approved April 4, 1888, March 3, 1905, April 9, 1906, and May 28, 1908 (appointments authorized by secs. 4402, 4404, and 4414, Revised Statutes)..... | \$435, 598. 90 |
| Salaries, clerks and messenger in the office of the Supervising Inspector General, at Washington, D. C..... | 10, 495. 01 |
| Total..... | 446, 093. 91 |
| Traveling expenses (actual and mileage)..... | 62, 844. 61 |
| Rents, offices..... | 11, 128. 34 |
| Stationery, supplies, and transportation of same..... | 3, 730. 69 |
| Telephone rents, telegrams, and postage..... | 2, 085. 89 |
| Witnesses' fees and mileage in cases of investigation..... | 1, 473. 50 |
| Furniture, instruments, etc., and repairs to same..... | 1, 442. 71 |
| Janitor service..... | 402. 85 |
| Ice, fuel, and electric light..... | 297. 99 |
| Toilet service, laundry, soap, etc..... | 125. 80 |
| Marine publications and official railway guides..... | 42. 50 |
| Post-office box rent..... | 12. 65 |
| Moving offices..... | 50. 00 |
| Miscellaneous..... | 31. 25 |
| Total traveling and miscellaneous expenses..... | 83, 668. 78 |
| Salaries as noted above..... | 446, 093. 91 |
| Total expenditures for year ended June 30, 1914..... | 529, 762. 69 |
| Total expenditures for year ended June 30, 1913..... | 523, 998. 20 |
| Increase, 1914..... | 5, 764. 49 |
| Salaries, 1914..... | 446, 093. 91 |
| Salaries, 1913..... | 441, 701. 05 |
| Increase, 1914..... | 4, 392. 86 |
| Contingent expenses, 1914..... | 83, 668. 78 |
| Contingent expenses, 1913..... | 82, 297. 15 |
| Increase, 1914..... | 1, 371. 63 |

| | |
|---|---------------|
| Rents, 1914..... | \$11, 128. 34 |
| Rents, 1913..... | 10, 209. 36 |
| Increase, 1914..... | 918. 98 |
| Traveling expenses, actual and mileage, 1914..... | 62, 844. 61 |
| Traveling expenses, actual and mileage, 1913..... | 63, 901. 75 |
| Decrease, 1914..... | 1, 057. 14 |

As shown above, there were small increases in salaries, contingent expenses, and rents, but a small decrease in traveling expenses in 1914 compared with the previous year. The decrease in traveling expenses was due to inspectors of the Service being allowed only actual expenses instead of mileage, as has heretofore been the practice. The saving would have been considerably greater, however, but for the fact that the number of inspectors in the Service who are required to travel was increased by an additional board.

NUMBER, CLASS, AND TONNAGE OF VESSELS INSPECTED.

There is submitted herewith a tabulated statement showing the number, class, and tonnage of vessels regularly inspected by this Service and granted certificates.

**CERTIFICATES OF INSPECTION ISSUED TO STEAM, SAIL, AND MOTOR VESSELS AND TO BARGES DURING THE FISCAL YEAR ENDED JUNE 30, 1914,
BY DISTRICTS.**

| Supervising district. | Local district. | Domestic vessels. | | | | | | | | | | Total. | | Foreign passenger steam vessels. | | Total. | |
|-----------------------|----------------------------|-------------------|----------------|----------------|----------------|-------------------------|----------------|-------------------|----------------|------------------|----------------|-----------|----------------|----------------------------------|----------------|-----------|----------------|
| | | Steam vessels. | | Motor vessels. | | Passenger sail vessels. | | Passenger barges. | | Seagoing barges. | | | | | | | |
| | | Num-ber. | Gross tonnage. | Num-ber. | Gross tonnage. | Num-ber. | Gross tonnage. | Num-ber. | Gross tonnage. | Num-ber. | Gross tonnage. | Num-ber. | Gross tonnage. | Num-ber. | Gross tonnage. | Num-ber. | Gross tonnage. |
| First | San Francisco, Cal..... | 355 | 506,153 | 49 | 3,478 | 1 | 1,097 | 194 | 3 | 8,659 | 409 | 519,581 | 11 | 57,579 | 420 | 577,160 | |
| | Honolulu, Hawaii..... | 23 | 11,516 | 5 | 290 | | | | 1 | 913 | 29 | 12,719 | 9 | 98,940 | 38 | 111,659 | |
| | Juneau, Alaska..... | 49 | 3,741 | 6 | 190 | | | | | | 55 | 3,931 | | | 55 | 3,931 | |
| | Los Angeles, Cal..... | 18 | 15,755 | 13 | 893 | | | | | | 31 | 16,648 | | 593 | 32 | 17,241 | |
| | Portland, Ore..... | 139 | 43,220 | 23 | 1,890 | | | | | | 165 | 46,125 | | | 165 | 46,125 | |
| Second | St. Michael, Alaska..... | 28 | 11,047 | 1 | 18 | | | | 3 | 1,015 | 29 | 11,065 | | 778 | 30 | 11,843 | |
| | Seattle, Wash..... | 274 | 146,705 | 34 | 3,982 | 1 | 754 | 164 | 14 | 18,333 | 324 | 169,938 | 42 | 258,006 | 366 | 428,844 | |
| | New York, N. Y..... | 1,224 | 894,099 | 47 | 1,518 | | | | 10 | 3,270 | 1,453 | 1,037,165 | 249 | 2,689,416 | 1,702 | 3,726,581 | |
| | Albany, N. Y..... | 157 | 61,418 | | | 1 | 248 | | | | 168 | 61,666 | | | 168 | 61,666 | |
| | New Haven, Conn..... | 90 | 12,079 | 40 | 1,258 | | | | | | 131 | 14,496 | | | 131 | 14,496 | |
| Third | Philadelphia, Pa..... | 298 | 179,274 | 26 | 1,286 | | | | | | 319 | 180,560 | 37 | 278,187 | 450 | 509,939 | |
| | Norfolk, Va..... | 200 | 98,393 | 24 | 658 | | | 2 | 620 | 82 | 60,527 | 308 | 160,198 | 2 | 7,258 | 310 | 167,456 |
| | Baltimore, Md..... | 259 | 152,432 | 39 | 1,822 | | | | | 22 | 20,812 | 320 | 175,066 | 20 | 178,411 | 340 | 353,477 |
| | Charleston, S. C..... | 66 | 8,540 | 16 | 432 | | | | | | 82 | 9,022 | | | 82 | 9,022 | |
| | Jacksonville, Fla..... | 62 | 16,175 | 27 | 942 | | | | | 5 | 5,227 | 94 | 22,344 | 2 | 146 | 96 | 22,490 |
| Fourth | Savannah, Ga..... | 58 | 46,054 | 4 | 306 | | | | | 3 | 1,477 | 65 | 47,837 | | | 65 | 47,837 |
| | St. Louis, Mo..... | 86 | 15,795 | 16 | 361 | | | | | | 102 | 16,156 | | | 102 | 16,156 | |
| | Dubuque, Iowa..... | 57 | 5,287 | 29 | 1,236 | | | | | | 89 | 7,180 | | | 89 | 7,180 | |
| | Boston, Mass..... | 224 | 160,533 | 6 | 190 | | | 3 | 657 | 49 | 53,393 | 279 | 214,116 | 40 | 386,720 | 319 | 600,836 |
| | Bangor, Me..... | 65 | 16,015 | 7 | 262 | | | | | 9 | 9,171 | 81 | 25,478 | 2 | 490 | 83 | 25,968 |
| Fifth | New London, Conn..... | 66 | 19,956 | 12 | 357 | | | | | 6 | 6,341 | 84 | 26,654 | | | 84 | 26,654 |
| | Portland, Me..... | 58 | 20,258 | 3 | 91 | | | | | 16 | 9,189 | 77 | 29,538 | 11 | 95,114 | 88 | 124,652 |
| | Providence, R. I..... | 128 | 89,124 | 9 | 247 | | | | | 25 | 26,674 | 162 | 116,045 | | | 162 | 116,045 |
| | Louisville, Ky..... | 41 | 6,435 | 7 | 316 | | | | | | 48 | 6,751 | | | 48 | 6,751 | |
| | Evansville, Ind..... | 54 | 9,985 | 2 | 135 | | | | | | 56 | 10,120 | | | 56 | 10,120 | |
| Sixth | Memphis, Tenn..... | 61 | 9,321 | 6 | 139 | | | | | | 67 | 9,460 | | | 67 | 9,460 | |
| | Nashville, Tenn..... | 73 | 11,355 | | | | | | | | 73 | 11,355 | | | 73 | 11,355 | |
| | Pittsburgh, Pa..... | 101 | 17,087 | | | | | | | | 101 | 17,087 | | | 101 | 17,087 | |
| | Cincinnati, Ohio..... | 44 | 9,976 | | | | | | | 44 | 9,976 | | | 44 | 9,976 | | |
| | Point Pleasant, W. Va..... | 59 | 7,415 | 4 | 88 | | | | | 63 | 7,503 | | | 63 | 7,503 | | |
| Seventh | Detroit, Mich..... | 104 | 126,217 | 8 | 655 | | | | | | 112 | 129,872 | 6 | 7,678 | 118 | 137,550 | |
| | Chicago, Ill..... | 151 | 272,653 | 6 | 402 | | | | | | 157 | 273,055 | | | 157 | 273,055 | |
| | Duluth, Minn..... | 99 | 284,735 | 3 | 79 | | | | | | 102 | 284,814 | | | 102 | 284,814 | |
| | Grand Haven, Mich..... | 86 | 54,607 | 5 | 118 | | | | | | 91 | 54,725 | | | 91 | 54,725 | |
| | Marquette, Mich..... | 42 | 13,674 | 1 | 28 | | | | | | 43 | 13,702 | 6 | 2,231 | 49 | 15,933 | |
| Eighth | Milwaukee, Wis..... | 174 | 306,995 | 5 | 420 | | | | | | 179 | 307,415 | | | 179 | 307,415 | |

| | | | | | | | | | | | | | | |
|--------|-------------------------------|-------|-----------|---------|---------|---------|---------|-------|-----------|--------|-----------|--------|-----------|--------|
| North. | Port Huron, Mich. | 71 | 73,602 | 522,941 | 202 | 524,142 | 1 | 1,201 | 71 | 73,602 | 5 | 16,511 | 76 | 90,113 |
| | Cleveland, Ohio. | 262 | 522,941 | 262 | 524,142 | 202 | 524,142 | 1 | 1,201 | 203 | 524,142 | 203 | 524,142 | |
| | Buffalo, N. Y. | 262 | 522,941 | 262 | 524,142 | 202 | 524,142 | 1 | 1,201 | 265 | 524,142 | 265 | 524,142 | |
| | Burlington, Vt. | 262 | 522,941 | 262 | 524,142 | 202 | 524,142 | 1 | 1,201 | 265 | 524,142 | 265 | 524,142 | |
| | Burlington, N. Y. | 262 | 522,941 | 262 | 524,142 | 202 | 524,142 | 1 | 1,201 | 265 | 524,142 | 265 | 524,142 | |
| Tenth. | Oswego, N. Y. | 77 | 34,341 | 1 | 42 | 22 | 3,818 | 22 | 3,818 | 15 | 26,107 | 24 | 49,506 | |
| | Toledo, Ohio. | 99 | 184,880 | 1 | 23 | 100 | 184,953 | 100 | 184,953 | 18 | 15,185 | 95 | 49,506 | |
| | New Orleans, La. | 34 | 4,215 | 5 | 4,776 | 239 | 53,416 | 36 | 149,239 | 275 | 54,151 | 101 | 185,146 | |
| | Palmdale, Fla. | 195 | 42,715 | 34 | 4,215 | 63 | 9,641 | 64 | 1,874 | 64 | 1,874 | 101 | 185,146 | |
| | Apalachicola, Fla. | 46 | 8,675 | 15 | 580 | 120 | 52,544 | 11 | 19,359 | 131 | 106,583 | 131 | 106,583 | |
| | Galveston, Tex. | 53 | 26,984 | 17 | 1,009 | 44 | 23,713 | 120 | 52,544 | 11 | 19,359 | 131 | 106,583 | |
| | Mobile, Ala. | 94 | 26,339 | 22 | 890 | 1 | 8,983 | 126 | 12,181 | 7 | 19,359 | 31 | 53,372 | |
| | San Juan, P. R. | 9 | 1,349 | 2 | 72 | 2 | 576 | 13 | 1,967 | 10 | 30,375 | 23 | 32,372 | |
| | Total, 1914. | 6,217 | 5,079,432 | 577 | 31,030 | 564 | 473,318 | 7,385 | 5,596,504 | 545 | 4,374,006 | 7,385 | 9,970,510 | |
| | Total, 1913. | 6,395 | 5,109,569 | 530 | 26,263 | 557 | 492,548 | 7,515 | 5,644,678 | 450 | 3,427,434 | 7,965 | 9,071,992 | |
| | Increase (+) or decrease (-). | -178 | -30,137 | +47 | +4,767 | +7 | -19,230 | +85 | -48,174 | +95 | +946,602 | -35 | +898,518 | |

VESSELS INSPECTED AND OFFICERS LICENSED DURING THE FISCAL YEAR ENDED JUNE 30, 1914, BY GEOGRAPHICAL DIVISIONS.

| Geographical division. | Domestic vessels. | | | | | | | | | | Officers licensed. | | | |
|-------------------------------|-------------------|----------------|----------|----------------|----------|--------------------|----------|----------------|----------|----------------|----------------------------|----------------|----------|----------------|
| | Steam vessels. | | | | | Passenger vessels. | | | | | Foreign passenger vessels. | | Total. | |
| | Num-ber. | Gross tonnage. | Num-ber. | Gross tonnage. | Num-ber. | Gross tonnage. | Num-ber. | Gross tonnage. | Num-ber. | Gross tonnage. | Num-ber. | Gross tonnage. | Num-ber. | Gross tonnage. |
| Pacific coast. | 886 | 738,137 | 131 | 10,741 | 2 | 1,851 | 2 | 368 | 1,042 | 780,007 | 64 | 416,796 | 1,106 | 843,803 |
| Atlantic coast. | 2,965 | 1,744,960 | 260 | 9,449 | 12 | 3,860 | 479 | 412,831 | 3,717 | 2,171,368 | 363 | 3,635,743 | 4,080 | 5,807,110 |
| Western rivers. | 576 | 92,666 | 64 | 2,375 | 3 | 657 | 1 | 1,201 | 643 | 96,588 | 63 | 67,686 | 643 | 96,588 |
| Northern lakes. | 1,388 | 2,416,025 | 32 | 1,829 | 1 | 107 | 1 | 30,366 | 1,422 | 2,419,762 | 53 | 2,487,348 | 1,609 | 2,487,348 |
| Gulf coast. | 402 | 87,064 | 90 | 6,736 | 6 | 5,613 | 63 | 30,366 | 561 | 129,779 | 63 | 263,892 | 626 | 383,661 |
| Total, 1914. | 6,217 | 5,079,432 | 577 | 31,030 | 3 | 2,009 | 564 | 473,318 | 7,385 | 5,896,504 | 545 | 4,374,006 | 7,930 | 9,970,510 |
| Total, 1913. | 6,365 | 5,109,569 | 530 | 26,263 | 2 | 2,000 | 537 | 492,548 | 7,515 | 5,644,678 | 450 | 3,427,314 | 7,965 | 9,071,992 |
| Increase (+) or decrease (-). | -178 | -30,137 | +47 | +4,767 | +1 | +99 | -7 | -19,230 | -130 | -48,174 | +95 | +946,692 | -35 | +898,518 |

MISCELLANEOUS INSPECTIONS.

Following is a statement of steam vessels granted letters of approval of designs of boilers, engines, and other operating machinery inspected under act of Congress approved June 9, 1910, not inspected annually, only one inspection made; hulls of United States Government vessels inspected, and boilers in or for United States Government steamers and buildings inspected during the year ended June 30, 1914:

| Local inspection district (port). | Steam vessels granted letters of approval. | | Government vessels inspected. | Government boilers inspected. | Local inspection district (port). | Steam vessels granted letters of approval. | | Government vessels inspected. | Government boilers inspected. |
|-----------------------------------|--|----------------|-------------------------------|-------------------------------|-----------------------------------|--|----------------|-------------------------------|-------------------------------|
| | Number. | Gross tonnage. | | | | Number. | Gross tonnage. | | |
| San Francisco, Cal. | | | 6 | 63 | Evansville, Ind. | | | | 4 |
| Honolulu, Hawaii | | | | 9 | Memphis, Tenn. | 1 | 14 | 20 | 130 |
| Juneau, Alaska | 1 | 48 | | 2 | Nashville, Tenn. | | | 3 | 40 |
| Los Angeles, Cal. | 1 | 22 | | 2 | Pittsburgh, Pa. | 4 | 40 | | 41 |
| Portland, Oreg. | | | | 42 | Cincinnati, Ohio | 2 | 73 | 1 | 25 |
| St. Michael, Alaska | 2 | 58 | | 11 | Point Pleasant, W. Va. | | | | 67 |
| Seattle, Wash. | 4 | 260 | 1 | 43 | Detroit, Mich. | 1 | 5 | 5 | 9 |
| New York, N. Y. | 4 | 68 | 4 | 110 | Chicago, Ill. | | | | 7 |
| Albany, N. Y. | | | | 7 | Duluth, Minn. | | | | 5 |
| New Haven, Conn. | | | | 6 | Grand Haven, Mich. | 8 | 145 | 3 | 8 |
| Philadelphia, Pa. | | | | 21 | Marquette, Mich. | 2 | 59 | 1 | 3 |
| Norfolk, Va. | 3 | 100 | | 23 | Milwaukee, Wis. | 9 | 232 | 5 | 30 |
| Baltimore, Md. | 1 | 16 | | 60 | Port Huron, Mich. | 2 | 167 | 2 | 2 |
| Charleston, S. C. | | | | 35 | Cleveland, Ohio | 1 | 13 | | |
| Jacksonville, Fla. | | | | 9 | Buffalo, N. Y. | 3 | 50 | 1 | 3 |
| Savannah, Ga. | | | | 8 | Oswego, N. Y. | | | 1 | 2 |
| St. Louis, Mo. | | | 2 | 103 | Toledo, Ohio | | | 4 | 6 |
| Dubuque, Iowa | | | | 87 | New Orleans, La. | | | 17 | 94 |
| Boston, Mass. | 3 | 140 | | 21 | Apalachicola, Fla. | | | 2 | 2 |
| Bangor, Me. | 3 | 136 | | | Galveston, Tex. | | | 2 | 23 |
| New London, Conn. | | | | 16 | Mobile, Ala. | | | 2 | 63 |
| Portland, Me. | 4 | 141 | 1 | 10 | San Juan, P. R. | | | | 4 |
| Providence, R. I. | 1 | 13 | 2 | 19 | | | | | |
| Louisville, Ky. | | | | 61 | | | | | |
| | | | | | Total | 60 | 1,798 | 92 | 1,326 |

REINSPECTIONS.

Following is a statement of reinspections of passenger and ferry steamers made by boards of local inspectors during the year:

| Local inspection district. | Passenger steamers. | Ferry steamers. | Total. | Local inspection district. | Passenger steamers. | Ferry steamers. | Total. |
|----------------------------|---------------------|-----------------|--------|----------------------------|---------------------|-----------------|--------|
| San Francisco, Cal. | | 84 | 84 | Memphis, Tenn. | 28 | 5 | 33 |
| Honolulu, Hawaii | 15 | | 15 | Nashville, Tenn. | 17 | | 17 |
| Los Angeles, Cal. | 2 | 2 | 4 | Pittsburgh, Pa. | 12 | 12 | 24 |
| Portland, Oreg. | 56 | 19 | 75 | Cincinnati, Ohio | 14 | 18 | 32 |
| Seattle, Wash. | 46 | 6 | 52 | Point Pleasant, W. Va. | 27 | 29 | 56 |
| New York, N. Y. | 369 | 306 | 675 | Detroit, Mich. | 43 | 34 | 77 |
| Albany, N. Y. | 85 | 34 | 119 | Chicago, Ill. | 58 | | 58 |
| New Haven, Conn. | 25 | 3 | 28 | Duluth, Minn. | 14 | 8 | 22 |
| Philadelphia, Pa. | 93 | 68 | 161 | Grand Haven, Mich. | 108 | 9 | 117 |
| Norfolk, Va. | 140 | 20 | 160 | Marquette, Mich. | 9 | | 9 |
| Baltimore, Md. | 193 | 2 | 195 | Milwaukee, Wis. | 80 | | 80 |
| Charleston, S. C. | 16 | 2 | 18 | Port Huron, Mich. | 25 | 3 | 28 |
| Jacksonville, Fla. | 2 | 3 | 5 | Cleveland, Ohio | 21 | | 21 |
| Savannah, Ga. | 31 | | 31 | Buffalo, N. Y. | 39 | 8 | 47 |
| St. Louis, Mo. | 60 | 35 | 95 | Burlington, Vt. | 8 | 3 | 11 |
| Dubuque, Iowa | 14 | 5 | 19 | Oswego, N. Y. | 26 | | 26 |
| Boston, Mass. | 110 | 39 | 149 | Toledo, Ohio | 22 | 2 | 24 |
| Bangor, Me. | 17 | 1 | 18 | New Orleans, La. | 149 | 51 | 200 |
| New London, Conn. | 31 | 7 | 38 | Apalachicola, Fla. | 4 | | 4 |
| Portland, Me. | 61 | 10 | 71 | Galveston, Tex. | 4 | 1 | 5 |
| Providence, R. I. | 39 | 11 | 50 | San Juan, P. R. | 40 | 6 | 46 |
| Louisville, Ky. | 14 | 6 | 20 | | | | |
| Evansville, Ind. | 22 | 4 | 26 | Total | 2,189 | 866 | 3,045 |

MARINE BOILER PLATES TESTED.

During the year ended June 30, 1914, 3,159 marine boiler plates were tested at the mills by assistant inspectors of this Service, under act of Congress approved January 22, 1894. Of this number 2,993 were accepted and 166 were rejected, as follows:

| Inspected by Assistant Inspector— | Plates rejected because of— | | | | | | | | | | Total. | | |
|------------------------------------|-------------------------------------|-------------------------|-------------------|-------------|-------------|--------------|---------------|--------------|---------------|-------------------|-----------|-----------|------------|
| | Spotted at shears after inspection. | Lost in shipping house. | Tensile strength. | Elongation. | Lamination. | Light gauge. | Reduced area. | Bad surface. | Bending test. | Wrong dimensions. | Rejected. | Accepted. | Inspected. |
| E. G. Allen, Coatesville, Pa..... | 5 | 6 | 13 | 1 | 2 | 4 | ... | 26 | ... | ... | 57 | 1,388 | 1,445 |
| J. B. Hayward, Pittsburgh, Pa..... | ... | ... | 20 | 26 | 11 | 2 | 9 | 20 | 2 | ... | 90 | 1,240 | 1,330 |
| S. A. Mills, Philadelphia, Pa..... | 1 | ... | 2 | ... | ... | ... | ... | 4 | ... | ... | 7 | 204 | 211 |
| S. H. Hunter, Cleveland, Ohio..... | 2 | ... | 1 | ... | ... | ... | 1 | 4 | 1 | 2 | 11 | 91 | 102 |
| John T. Farnham, Chicago, Ill..... | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | 70 | 71 |
| Total, 1914..... | 9 | 6 | 36 | 27 | 13 | 6 | 10 | 54 | 3 | 2 | 166 | 2,993 | 3,159 |
| Total, 1913..... | 18 | 32 | 35 | 13 | 19 | 8 | 25 | 53 | 5 | ... | 208 | 3,000 | 3,208 |
| Increase (+) or decrease (—)..... | -9 | -26 | +1 | +14 | -6 | -2 | -15 | +1 | -2 | +2 | -42 | -7 | -49 |

Also there were inspected at the mills a large number of steel bars for braces and stay bolts in marine boilers and several hundred plates for stock and repairs. Many requests from other branches and departments of the Government for tests of material at the mills were complied with and reports rendered to the proper officials.

NEW LIFE PRESERVERS INSPECTED.

During the fiscal year inspectors of this Service inspected new life preservers as follows:

| Kind. | Inspected. | Rejected. | Passed. |
|-------------------------|------------|-----------|---------|
| Block cork..... | 168,968 | 1,210 | 167,758 |
| Tule..... | 6,000 | ..... | 6,000 |
| Compressed cork..... | 130 | ..... | 130 |
| Balsa wood (A B C)..... | 234 | ..... | 234 |
| Total..... | 175,332 | 1,210 | 174,122 |

The above statement of the number of new life preservers examined shows a decrease from the previous year of 58,351. There was a decrease from the previous year of 2,079 in the number of life preservers rejected.

OFFICERS LICENSED.

There were 18,871 officers of all grades licensed during the fiscal year ended June 30, 1914. The number licensed for each grade, by local districts, is shown in the table following.

| Local district. | Masters of steam vessels. | Masters of steam yachts. | Mates of ocean steamers. | Mates of inland steamers. | First-class pilots. | Second-class and special pilots. | Chief engineers. | Assistant engineers. | Special engineers. | Joint pilots and engineers. | Engineers of motor vessels other than steam. | Operators of motor ves- sels. | Masters of sail vessels of over 700 gross tons. | Mates of sail vessels of over 700 gross tons. | Masters of barges of over 100 gross tons. | Total of all grades. |
|------------------------|---------------------------|--------------------------|--------------------------|---------------------------|---------------------|----------------------------------|------------------|----------------------|--------------------|-----------------------------|--|----------------------------------|--|--|--|----------------------|
| San Francisco, Cal. | 206 | 172 | 15 | 28 | 16 | 208 | 238 | 1 | 1 | 69 | 440 | 4 | 2 | 1,397 | 72 | |
| Honolulu, Hawaii. | 10 | 10 | 3 | 2 | 10 | 4 | 1 | 1 | 1 | 4 | 24 | 163 | 2 | 2 | 123 | 233 |
| Juneau, Alaska. | 10 | 1 | 3 | 2 | 10 | 4 | 1 | 1 | 1 | 4 | 90 | 163 | 2 | 2 | 481 | 89 |
| Los Angeles, Cal. | 13 | 5 | 1 | 2 | 4 | 22 | 6 | 1 | 1 | 16 | 163 | 163 | 2 | 2 | 1,134 | 2,782 |
| Portland, Oreg. | 39 | 1 | 14 | 1 | 8 | 64 | 16 | 2 | 2 | 14 | 320 | 155 | 15 | 5 | 6 | 182 |
| St. Michael, Alaska. | 10 | 1 | 4 | 2 | 1 | 14 | 1 | 1 | 1 | 1 | 55 | 572 | 15 | 5 | 2 | 223 |
| Seattle, Wash. | 158 | 56 | 49 | 1 | 25 | 121 | 53 | 2 | 2 | 75 | 572 | 15 | 5 | 1 | 1 | 993 |
| New York, N. Y. | 591 | 2 | 116 | 54 | 163 | 19 | 644 | 263 | 5 | 51 | 854 | 15 | 4 | 6 | 1 | 1,134 |
| Albany, N. Y. | 26 | 10 | 9 | 16 | 82 | 5 | 2 | 2 | 2 | 25 | 114 | 5 | 5 | 2 | 2 | 282 |
| New Haven, Conn. | 20 | 3 | 4 | 8 | 17 | 25 | 2 | 2 | 2 | 24 | 622 | 5 | 5 | 1 | 1 | 993 |
| Philadelphia, Pa. | 110 | 25 | 12 | 25 | 26 | 114 | 29 | 38 | 5 | 20 | 400 | 5 | 5 | 7 | 7 | 718 |
| Norfolk, Va. | 101 | 16 | 2 | 28 | 26 | 79 | 38 | 5 | 1 | 39 | 361 | 5 | 5 | 1 | 1 | 777 |
| Baltimore, Md. | 109 | 30 | 26 | 28 | 35 | 89 | 55 | 5 | 1 | 39 | 361 | 5 | 5 | 1 | 1 | 191 |
| Charleston, S. C. | 21 | 3 | 8 | 18 | 35 | 4 | 1 | 5 | 4 | 14 | 75 | 4 | 1 | 1 | 1 | 512 |
| Jacksonville, Fla. | 22 | 3 | 4 | 5 | 17 | 18 | 10 | 1 | 1 | 32 | 395 | 4 | 1 | 1 | 1 | 183 |
| Savannah, Ga. | 29 | 5 | 2 | 12 | 8 | 18 | 20 | 1 | 1 | 14 | 75 | 4 | 1 | 1 | 1 | 403 |
| St. Louis, Mo. | 43 | 26 | 38 | 45 | 7 | 21 | 8 | 1 | 4 | 6 | 234 | 7 | 7 | 1 | 1 | 232 |
| Dubuque, Iowa. | 18 | 7 | 4 | 5 | 21 | 8 | 1 | 1 | 1 | 10 | 158 | 27 | 4 | 1 | 1 | 432 |
| Boston, Mass. | 121 | 63 | 5 | 30 | 19 | 150 | 89 | 4 | 1 | 25 | 476 | 27 | 4 | 1 | 1 | 1,014 |
| Bangor, Me. | 24 | 3 | 4 | 6 | 11 | 40 | 1 | 1 | 1 | 15 | 187 | 5 | 1 | 1 | 1 | 297 |
| New London, Conn. | 15 | 2 | 2 | 8 | 7 | 20 | 8 | 1 | 1 | 9 | 134 | 7 | 7 | 1 | 1 | 204 |
| Portland, Me. | 29 | 3 | 4 | 5 | 6 | 34 | 8 | 1 | 1 | 11 | 181 | 8 | 8 | 1 | 1 | 293 |
| Providence, R. I. | 25 | 9 | 10 | 13 | 66 | 15 | 7 | 1 | 1 | 20 | 198 | 7 | 7 | 1 | 1 | 367 |
| Louisville, Ky. | 15 | 21 | 10 | 2 | 20 | 7 | 1 | 1 | 1 | 8 | 56 | 4 | 4 | 1 | 1 | 141 |
| Evansville, Ind. | 12 | 16 | 14 | 4 | 32 | 2 | 1 | 1 | 1 | 7 | 75 | 2 | 2 | 1 | 1 | 134 |
| Memphis, Tenn. | 20 | 19 | 15 | 2 | 20 | 8 | 1 | 1 | 1 | 2 | 130 | 3 | 3 | 1 | 1 | 220 |
| Nashville, Tenn. | 15 | 19 | 15 | 2 | 20 | 8 | 1 | 1 | 1 | 3 | 76 | 4 | 4 | 1 | 1 | 158 |
| Pittsburgh, Pa. | 23 | 29 | 10 | 7 | 34 | 17 | 6 | 1 | 1 | 4 | 64 | 3 | 3 | 1 | 1 | 190 |
| Cincinnati, Ohio. | 17 | 21 | 5 | 4 | 14 | 4 | 1 | 1 | 1 | 4 | 62 | 3 | 3 | 1 | 1 | 127 |
| Point Pleasant, W. Va. | 16 | 26 | 7 | 4 | 19 | 7 | 1 | 1 | 1 | 3 | 44 | 3 | 3 | 1 | 1 | 126 |
| Detroit, Mich. | 47 | 29 | 9 | 34 | 36 | 2 | 2 | 2 | 2 | 10 | 166 | 44 | 44 | 1 | 1 | 303 |
| Chicago, Ill. | 51 | 1 | 1 | 31 | 10 | 68 | 21 | 1 | 1 | 10 | 166 | 44 | 44 | 1 | 1 | 303 |
| Duluth, Minn. | 26 | 15 | 7 | 21 | 13 | 1 | 1 | 1 | 1 | 3 | 222 | 2 | 2 | 1 | 1 | 127 |
| Grand Haven, Mich. | 15 | 17 | 18 | 38 | 16 | 2 | 1 | 1 | 1 | 3 | 222 | 2 | 2 | 1 | 1 | 330 |
| Marquette, Mich. | 8 | 6 | 5 | 16 | 2 | 1 | 1 | 1 | 1 | 2 | 101 | 1 | 1 | 1 | 1 | 141 |
| Milwaukee, Wis. | 27 | 41 | 15 | 82 | 47 | 1 | 1 | 1 | 1 | 5 | 88 | 1 | 1 | 1 | 1 | 306 |
| Port Huron, Mich. | 47 | 47 | 2 | 61 | 49 | 7 | 1 | 1 | 1 | 1 | 44 | 1 | 1 | 1 | 1 | 251 |
| Cleveland, Ohio. | 33 | 1 | 43 | 7 | 65 | 16 | 5 | 1 | 1 | 51 | 51 | 1 | 1 | 1 | 1 | 221 |
| Buffalo, N. Y. | 45 | 28 | 31 | 106 | 34 | 1 | 1 | 1 | 1 | 4 | 121 | 1 | 1 | 1 | 1 | 371 |
| Burlington, Vt. | 2 | 1 | 10 | 8 | 2 | 1 | 1 | 1 | 1 | 1 | 47 | 1 | 1 | 1 | 1 | 71 |
| Oswego, N. Y. | 18 | 10 | 16 | 23 | 7 | 1 | 1 | 1 | 1 | 1 | 135 | 4 | 4 | 1 | 1 | 211 |
| Toledo, Ohio. | 13 | 7 | 5 | 29 | 6 | 1 | 1 | 1 | 1 | 4 | 66 | 2 | 2 | 1 | 1 | 130 |
| New Orleans, La. | 98 | 14 | 18 | 42 | 62 | 108 | 11 | 3 | 3 | 70 | 284 | 2 | 2 | 1 | 1 | 710 |
| Apalachicola, Fla. | 36 | 7 | 7 | 6 | 10 | 26 | 2 | 1 | 1 | 35 | 396 | 2 | 2 | 1 | 1 | 528 |
| Galveston, Tex. | 40 | 14 | 9 | 20 | 43 | 9 | 3 | 3 | 3 | 27 | 259 | 2 | 2 | 1 | 1 | 424 |
| Mobile, Ala. | 27 | 2 | 16 | 16 | 21 | 58 | 1 | 1 | 1 | 25 | 170 | 2 | 2 | 1 | 1 | 338 |
| San Juan, P. R. | 6 | 3 | 2 | 6 | 8 | 1 | 1 | 1 | 1 | 4 | 22 | 1 | 1 | 1 | 1 | 53 |
| Total, 1914. | 2,407 | 2 | 565 | 438 | 838 | 588 | 2,925 | 1,203 | 47 | 15 | 717 | 8,989 | 111 | 18 | 8 | 18,871 |
| Total, 1913. | 4,497 | 1 | 579 | 360 | 1,256 | 1,110 | 6,991 | 1,296 | 104 | 27 | 736 | 9,410 | 91 | 14 | 10 | 26,482 |
| Increase. | | 1 | 78 | | | | | | | | | | | | | |
| Decrease. | 2,090 | | 14 | | 418 | 522 | 4,066 | 93 | 57 | 12 | 19 | 421 | 20 | 4 | 2 | 7,611 |

EXAMINATIONS FOR COLOR BLINDNESS.

During the year ended June 30, 1914, 4,829 applicants for original and renewal of licenses were examined for visual defects, 61 of whom were found color blind or with other visual defects and rejected, and 4,768 were passed. As compared with the previous year, these figures show a decrease of 2,841 in the number examined and 2,818 in the number passed.

LIVES LOST ON VESSELS SUBJECT TO INSPECTION.

Following is a statement showing the loss of life on vessels subject to inspection during the fiscal year ended June 30, 1914, by supervising inspection districts and by causes:

| Supervising district. | Fire. | Collision. | Explosion or accidental escape of steam. | Wreck. | Foundered in severe storms. | Sinking. | Accidental drowning. | Suicide. | Miscellaneous. | Total. |
|-----------------------|-------|------------|--|--------|-----------------------------|----------|----------------------|----------|----------------|--------|
| First: | | | | | | | | | | |
| Crew..... | | 2 | 2 | 10 | | 1 | 13 | 2 | | 30 |
| Passengers..... | | | | 24 | | | 3 | 15 | | 42 |
| Second: | | | | | | | | | | |
| Crew..... | 1 | 13 | 12 | | 10 | 6 | 23 | | 2 | 67 |
| Passengers..... | | 3 | | | | | 1 | 15 | 2 | 21 |
| Third: | | | | | | | | | | |
| Crew..... | 1 | 28 | | | | 1 | 5 | 2 | 1 | 38 |
| Passengers..... | | 16 | | | | | 1 | 1 | 2 | 20 |
| Fourth: | | | | | | | | | | |
| Crew..... | | | | | | 3 | 3 | | | 6 |
| Passengers..... | | | | | | 1 | 1 | 4 | | 5 |
| Fifth: | | | | | | | | | | |
| Crew..... | 1 | 1 | | | 3 | 28 | 4 | | 1 | 38 |
| Passengers..... | | 1 | | | | | 1 | 2 | | 4 |
| Sixth: | | | | | | | | | | |
| Crew..... | | | | | | 2 | 14 | 1 | 1 | 18 |
| Passengers..... | | 1 | | | | | | | | 1 |
| Seventh: Crew..... | | | 8 | | | | 9 | | | 17 |
| Eighth: | | | | | | | | | | |
| Crew..... | | | 1 | | 176 | 1 | 13 | 1 | 4 | 196 |
| Passengers..... | | | | | | | 2 | 4 | | 6 |
| Ninth: | | | | | | | | | | |
| Crew..... | | 1 | 2 | | | | 12 | 2 | 7 | 24 |
| Passengers..... | | | | | | | 1 | 1 | | 2 |
| Tenth: | | | | | | | | | | |
| Crew..... | 6 | 1 | | | | 30 | 6 | | | 43 |
| Passengers..... | 1 | | | | | | 3 | | | 4 |
| Total..... | 10 | 67 | 25 | 34 | 189 | 72 | 115 | 50 | 21 | 582 |

* Twenty-three cases of accidental drowning are reported to have been caused by the excessive use of liquor.

† Increase of 146 over previous year.

ACCIDENTS RESULTING IN LOSS OF LIFE.

The total number of accidents resulting in loss of life during the past fiscal year was 232, an increase of 166 over the fiscal year ended June 30, 1913. Enumerated by supervising inspection districts, accidents occurred as follows: First, 35; second, 55; third, 15; fourth, 9; fifth, 15; sixth, 17; seventh, 10; eighth, 35; ninth, 26; tenth, 15.

The following disasters resulted in an unusually large loss of life:

On August 17, 1913, the passenger steamer *State of California* struck an uncharted rock during low tide in Gambier Bay, Alaska, and sank within three minutes, while making for the beach, resulting in 24 passengers and 7 of the crew losing their lives.

On August 30, 1913, the boilers of the towing steamer *Alice* exploded while vessel was ascending the Ohio River, killing 8 of the crew and injuring 6 others.

During an extremely severe storm, which raged with uncommon fury on all the Great Lakes, particularly on Lake Huron, November 9 to 10, 1913, the following steamers with their entire crews foundered,

resulting in the loss of 161 lives: *Henry B. Smith*, *Argus*, *Hydrus*, *Charles S. Price*, *John A. McGean*, *Isaac M. Scott*, *Wm. Nottingham*, and *James H. Martin*.

On December 26, 1913, while the towing steamer *Edgar F. Luckenbach* had the barges *A. G. Ropes* and *Undaunted* in tow on a hawser, when about 4 miles off shore near Barnegat, N. J., on account of the heavy seas the steamer was not able to hold up the barges and the master was compelled to cut them adrift, the barges going ashore and the crew of five men on each barge losing their lives.

On January 4, 1914, while the steamer *Oklahoma* was on voyage from New York, N. Y., to Port Arthur, Tex., in ballast, she broke in two about amidships, off the coast of New Jersey, in rough sea and with heavy wind blowing, with the result that 26 of the crew lost their lives.

On January 30, 1914, the steamers *Nantucket* and *Monroe* collided at 1.30 a. m., during a dense fog, near Winter Quarter Lightship, the *Monroe* sinking within 10 minutes, resulting in 16 passengers and 25 of the crew losing their lives.

On February 10, 1914, the passenger steamer *Gem* was discovered to be afire in the Mississippi River near Hahnville, La., and vessel was immediately beached. Five of the crew and one passenger lost their lives.

On April 28, 1914, the steamer *Benj. Noble*, which was laden with steel rails, foundered on Lake Superior during a severe storm in a heavy sea, resulting in the loss of the entire crew of 16 persons.

On May 11, 1914, while the steamer *Jefferson* was en route from Norfolk, Va., to New York, N. Y., a number of tubes in the starboard after boiler left the tube sheet, resulting in 11 of the crew being badly scalded, causing their death.

On May 15, 1914, the steamer *F. J. Luckenbach* sailed from Port Tampa, Fla., with a cargo of phosphate rock, bound for Baltimore, Md., with a crew of 29 persons on board. The vessel did not arrive at Baltimore, and is supposed to have been lost with all on board.

PASSENGERS CARRIED.

During the fiscal year 318,094,347 passengers were carried on steam vessels that are required by law to report the number of passengers carried. Dividing this number by 105, the total number of passengers lost, shows that 3,029,469 passengers were carried for each passenger lost. The total number of lives lost from all causes, passengers and crew, was 582.

ACTIVITIES OF THE SERVICE.

The Steamboat-Inspection Service, as its name implies, exists for the purpose of inspecting vessels of the American merchant marine which are required by law to be inspected, the licensing of officers, the conducting of investigations of casualties and violations of the law, the regulation of the transportation of persons and articles, and the making of certain inspections for other departments of the Government. Each of these purposes will be discussed in following pages of this report.

DESCRIPTION OF PRESENT FORM OF INSPECTION.

A careful examination of the General Rules and Regulations prescribed by the Board of Supervising Inspectors will show that the Steamboat-Inspection Service goes into considerable detail in the matter of the inspection of hulls and equipment, and of boilers of vessels subject to inspection. It might not be out of place at this time to refer to the nature of this inspection, especially in view of the fact that recommendations will be submitted on proposed improvements in inspection. At a meeting of the Board of Supervising Inspectors in January, 1911, there was promulgated a rule requiring the owner of every new vessel of over 100 gross tons, when making application for the first inspection of the vessel, to furnish the local inspectors of the district where the vessel is to be inspected a drawing, or blue print, in plan and section, showing fully the general construction of the vessel—whether of wood, iron, or steel—including dimensions; spacing of frames; disposition of hull plates, outside and in, or of outside and inside planks; construction of decks, construction of transverse and longitudinal bulkheads and location of same; space between decks; details of principal scarfs; a statement of the shapes, dimensions, and unit weights of all structural parts of the hull; and of the kinds of material of which made, including kinds of wood. This rule also required a full description of the riveting of all parts of an iron or steel hull. One result of the rule referred to has been to place in the possession of local inspectors certain valuable information of which they were formerly in ignorance. To this extent, therefore, the Service makes an effort to see that the vessels subject to its inspection are properly constructed, but the rule as it stands at present does not require the blue prints to be approved by the inspectors having jurisdiction; it simply requires that information be furnished to the inspectors of that district.

After the vessel has been constructed, as set forth in the blue prints furnished the local inspectors, the next requirement is that she be subjected to the regular annual inspection. These inspections are very rigid, the inspectors being required to examine every part of the hull and equipment. The statement that a certain number of life preservers is on board is not accepted by the inspector; he must actually see these life preservers, count them, examine them, and be assured that they are actually in good condition for service. The Service requires that all lifeboats and life rafts be examined, and the inspector satisfy himself, being guided by the Rules and Regulations, that they are of sufficient capacity and in proper condition to serve the purpose for which intended.

It is, of course, necessary that particular attention be given to the fire-fighting equipment. It is the duty of inspectors to see that there is a sufficient quantity of fire hose on board and in perfect condition. The inspector subjects the hose to the proper pressure, and if defective, as is sometimes the case, it is at once rejected.

The General Rules and Regulations provide that when vessels are placed in dry dock this fact be reported to the inspectors by the master of the vessel. The inspectors then, so far as possible, personally examine the vessels to see if their hulls are in proper condition.

The Rules and Regulations indicate that the Board of Supervising Inspectors has given special attention to the construction and inspec-

tion of boilers on vessels that are subject to inspection. Blue prints are required to be submitted to the local inspectors by the builders of marine boilers, and these blue prints must first be approved before the boiler can be used on steamers subject to inspection. This Service, however, is not satisfied with the mere matter of the approval of the blue prints but, pursuant to the authority conferred by certain statutes, the inspectors of this Service are required to test also those plates in boilers subject to a tensile strain—to ascertain their tensile strength, homogeneousness, toughness, and ability to withstand the effect of repeated heating and cooling—and no iron or steel plate may be used in the construction of such boilers that has not been inspected and approved under the rules of this Service.

When a new boiler is installed on a vessel it is inspected by the local inspectors of steam vessels, who subject it to severe tests, in order to ascertain whether it is in fact safe for use. This inspection is made every year thereafter that the vessel is navigated. When the hydrostatic test is applied by the inspector of boilers it is required that both inspectors witness the test, in order that there may be no mistake whatsoever as to the boiler's capacity.

PROPOSED IMPROVEMENTS IN INSPECTION.

The detailed description given above has been made in order that it may be more easily and clearly understood why certain improvements are suggested, discussed in paragraphs following. Particular attention will be given to hull, equipment, boiler, and motor-boat inspections.

HULL INSPECTION.

Reference has been made to the fact that under the rules of the Board of Supervising Inspectors blue prints descriptive of the hull construction of certain vessels are required to be filed with the local inspectors having jurisdiction, but, as has already been pointed out, it is not at present required that these blue prints be approved by the local inspectors with whom they are filed. Some thought has been given the question of whether it would not be advisable to require these blue prints to be approved by the Steamboat-Inspection Service, but such approval not to be given by the local inspectors. It is believed, instead, that there should be stationed in the office of the Supervising Inspector General a corps of experts whose business it would be to approve the proposed hull construction. This, it is thought, is necessary (1) because it would enable the Department to employ experts who are more familiar with hull construction than the local inspectors, and (2) it would result in that uniform administration of the law with which the Supervising Inspector General is charged.

To adopt such a system as this might require the enactment of a statute that would give this express authority to the Steamboat-Inspection Service, or if it should be determined that there is sufficient law to justify this action, certainly it would require a larger appropriation for the employment of experts for the purpose named. Furthermore, it would be a distinct departure from the principles that have heretofore governed the Steamboat-Inspection Service in the

matter of the approval of certain things by local inspectors, as it would place that approving power in the central office, thereby relieving the local inspectors of much responsibility, as well as obtaining more expert advice and a more uniform administration of the law. This is a matter requiring careful consideration. It is not one to be adopted without mature deliberation, but it is a question that faces this Service to-day and which will, as time goes on, require more and more attention.

The Steamboat-Inspection Service inspects vessels in order to make travel by water safer, and while this Service has done much to have lifeboat and fire-fighting apparatus provided, it nevertheless remains a fact that the most important thing to do is to make the ship itself as nearly unsinkable as possible. Having done this, it then becomes necessary to place on board the vessel the proper equipment to take care of those who travel on the ship, and to see that the vessel is properly manned. It is believed that the greatest peril which has to be met on board ship is fire, and in order to follow out the principle of making the ship itself as safe as possible, before taking up the question of equipment, the Government should require that all excursion steamers be entirely fireproof.

It may be claimed by some that it would not be practicable to make excursion steamers absolutely fireproof and yet be commercially successful, but attention is invited to a statement made in the annual report of the Supervising Inspector General for the fiscal year ended June 30, 1905. In that report it was stated that the question of the inflammability of the ordinary type of river and excursion steamer is one that should have the fullest consideration of the Department, and that while fire is one of the worst conditions that we have to meet, and the most appalling in its results, little or no effort has heretofore been made to design these steamers upon any different plan than those in use for years. It was pointed out that paints, compositions, and various other compounds of a so-called fireproof character have been suggested and tried, but none seems to have met the purpose of its design. It pointed out also that at that time there was in course of construction in one of the prominent shipyards of the country a river steamer nearly 300 feet in length that had been designed with a view to having her as nearly fireproof as utility would permit. In the same report for the succeeding fiscal year it was stated that the construction and operation of a fireproof excursion steamer had proven successful beyond the strongest hopes of those who conceived this type of construction. The Supervising Inspector General therefore renews his recommendation, made in the annual reports of 1905 and 1906, that Congress enact such legislation that will demand this fireproof construction to be required on all excursion steamers hereafter built or contracted for.

In the meantime, admitting that we do not have absolute fireproof construction on all excursion steamers now in use, the best precautions that we can take against loss of life and property is to maintain the very best fire-fighting equipment on these steamers, manned with crews well drilled and competent to fight fire should it break out.

Until Congress requires fireproof construction of excursion steamers, it is believed that the use of the sprinkler system, already adopted by many passenger steamers, should be extended.

INSPECTION OF EQUIPMENT.

The details that receive the attention of inspectors of this Service when examining the equipment of vessels have been pointed out in a general way. It becomes more and more important each year that careful scrutiny in these inspections shall not be relaxed, but that they shall be made more rigid, as the effectiveness of the inspection of equipment commences long before such equipment is placed on the vessel.

In the manufacture of life preservers, the Service has inspectors stationed at their plants and factories to examine them in process of making. In the case of lifeboats and life rafts, their design is required to be approved by the supervising inspector of the district having jurisdiction, and their construction is a matter under the constant supervision of inspectors. This much, at least, is true of factory inspection, but the number of inspectors in this Service is not sufficiently large to permit of that detailed factory inspection for which the Service strives.

BOILER INSPECTION.

Reference has already been made to the requirements of law and methods that are followed in the matter of boiler inspection, with particular reference to the approval of blue prints of the boilers. As in hull inspection, if we are to have that uniform administration of the law with which the Supervising Inspector General is charged, and which is certainly desired by the various business organizations that come in contact with this Service, then it is believed that the most effective way to secure that uniformity in boiler construction is to require that all boilers used on vessels subject to inspection shall first be approved by a corps of experts in the office of the Supervising Inspector General. While the inspectors in the field service have done excellent work in this respect, it nevertheless remains a fact that this Service itself must keep abreast of the most progressive business organizations; and, therefore, it is believed that the law should be so changed as to require the approval of the design of these boilers in the office of the Supervising Inspector General.

During the past year the Service has made special effort to see that actual internal examinations, so far as possible or practicable, were made of all boilers. It is believed that inspectors have given this matter their careful attention, and that the importance of the actual internal examinations has been so impressed upon the inspectors that better work in this direction is being done now than ever before.

It is the logical development of business and of administrative methods, as time goes on, to give increasing attention to detail. Certainly this has been true of boiler inspection as made by this Service; for instance, that particular attention which is being given in the matter of fusible plugs. This is referred to merely as an illustration of the extent of details of boiler inspection, and but serves to indicate the necessity for additional inspectors as the details of boiler inspections multiply.

At present numerous orders are given for repairs to boilers, and in districts where the pressure of work is not particularly great, personal attention can be given by inspectors to seeing whether these repairs

are actually made, but there are districts where the pressure of work is exceedingly great and where the number of inspectors is relatively small, so that it is impossible to have that "follow-up" system in the matter of boiler repairs that is desired. The fact is that the day of the affidavit is past, and the day of necessity for the actual "follow-up" system is at hand.

With reference to boiler inspection attention is invited to section 4433, Revised Statutes, which has long since passed the period of its usefulness, and is no longer adequate to meet the conditions it was designed to govern. For the purpose of determining the working steam pressure allowable on marine boilers it was, perhaps, at the time of its enactment, all that was necessary, but material, construction, and methods of operation have changed so rapidly that it can no longer be utilized to fairly determine working pressure. In its present form it takes into consideration only the value of the plate and the respective values of single and double riveted lap joints. No value is allowed any other rivet plan than the two mentioned, and single or double butt-strap joints, with rivet plan of any design, receive no consideration whatever in determining allowable pressure beyond that mentioned above. An examination of the rules and regulations of the leading boiler-insurance companies of this country will show that section 4433, Revised Statutes, is not consistent with the best modern practice, and it should, therefore, be so amended as to read, perhaps, "that every boiler hereafter constructed of plates inspected as required by Title LII shall be allowed a working steam pressure as determined by the rules of the Board of Supervising Inspectors." The result of the enactment of such a provision of law would give the Board of Supervising Inspectors that discretionary authority for arranging for boiler construction that the Board should possess, in order to make its rules meet the best modern practice.

MOTOR-VESSEL INSPECTION.

An examination of the act of June 9, 1910, known as the motor-boat act, will show that it far from meets the proper requirements for safeguarding life and property. Under this act more protection is afforded the crew on a steam tugboat than is afforded passengers on a motor boat carrying an unlimited number of passengers. An actual inspection of such motor vessels will show that the life-saving equipment is often insufficient. It is little short of criminal to permit motor boats used for pleasure purposes to have only the so-called buoyant cushion for everyone on board. Assuming the cushion to be actually buoyant, which is much to be doubted, it is still true that the very form of the cushion itself makes it unsatisfactory and ineffective for the purpose of saving the lives of women and children, many of whom know absolutely nothing about how to swim.

It is believed that the buoyant cushion should be done away with on pleasure motor boats as well as on passenger motor boats, and that there should be required to be carried a sufficient number of life preservers, such as approved by this Service, to take care of each and every person on board. To-day a large-sized motor boat engaged in towing operates entirely without inspection and without licensed officers, yet this boat is in competition with a steam towboat,

required to be inspected and to have licensed officers. This is unfair, and it is a condition that should be promptly corrected; but leaving aside the unfair competition that is apparent, the fact yet remains that the lives of persons traveling on inspected vessels are put in jeopardy by the ignorance of the persons who are navigating these uninspected motor boats, many of which have no licensed officers of any kind on board.

In previous reports reference has been made to the desirability of extending the inspection of motor boats, and it is believed that every motor boat used for carrying passengers should be inspected by the local inspectors of steamboats and given a certificate of inspection. This inspection need not be made in such detail as that of steamers, but it should be sufficiently extensive and thorough to assure the passengers that such boats are actually in good condition. The inspection would not put the owner of the boat to any expense, and is objected to only because it has been thought that it would interfere with the liberty and freedom of movement of the owners of such vessels. That upon which the owners of these vessels have insisted has not been liberty, but license, and the time has come when this matter should be given attention.

It should be further borne in mind that under present conditions a person is not required to be a citizen of the United States, 21 years of age, or able to read or write, in order to obtain a license as an operator of motor vessels, and yet we place in the hands of such a person the pilot rules. Is not such a practice as this making the law and the Government ridiculous, and is it not putting the stamp of approval by the Government upon a dangerous situation which should not exist and should be speedily corrected?

In this connection attention is called to the annual report for the fiscal year ended June 30, 1904, wherein, on page 12, it is stated:

During the fiscal year ended June 30, 1904, there were 206 motor vessels inspected, with a capacity of 9,391 tons, which is an increase over previous fiscal year of 53 vessels, with increase of 2,541 in tonnage. In this connection I desire to call attention to the fact of the small number of motor vessels that come under the jurisdiction of this Service under the present law, as compared with the numerous vessels of this class that, without any of the restrictions of law which govern and regulate the careful navigation of all vessels propelled by steam power; and all vessels of above 15 gross tons propelled by naphtha, gas, and other such means of propulsion carrying freight or passengers for hire, are permitted to navigate and compete with regularly licensed vessels carrying licensed officers, and are a constant menace to the lives and property not only of those employing them, but to those vessels regularly inspected and licensed by the Government. It is sincerely to be hoped that the early action of Congress will place some proper restrictions on all these motor vessels, making them equally responsible to the public for safe navigation as other vessels now under the supervision of the inspection laws.

Again, in the annual report for the fiscal year ended June 30, 1905, the attention of the Department was called to the motor-boat situation, with a recommendation beginning on page 10, which reads as follows:

There is no good reason why a vessel propelled by a motor other than steam should be exempted from any of the requirements demanded of a steam vessel, or should be granted privileges not accorded others, and aside from the fact that such discrimination is unfair and unjust to the owners of other vessels who are obliged to equip and man their vessels in accordance with the law, the same discrimination applies to the passengers who risk the dangers and vicissitudes of marine transportation and are subjected to the additional chance of accident consequent upon the careless navigation of these exempted motor vessels. They carry no licensed officers, but are generally

under the care of those who have no regard for the rights or safety of others, simply because there is no authority to demand it. Safety of life and property under all conditions should be the concern of the Government, and the traveling public should be as fully protected against the unskillful navigation of any power boat as it is against the indifferent operation of a steamboat. Passengers upon steamboats should not be placed at the mercy of unlicensed, inexperienced men directing the movements of some craft that may prove the destruction of the vessel that is fully manned, thoroughly equipped, and carefully navigated by competent and reliable licensed officers; neither is it fair to subject these licensed officers to the possibility of collision with a vessel that is navigated by persons who are not responsible to any authority.

In the annual report for the fiscal year ended June 30, 1907, the matter is again referred to on page 14 as follows:

By reference to the statistics of inspection of the different classes of vessels (p. 10), it is shown that there was a decrease from the previous year of 55 in number and 644 in tonnage of motor vessels inspected, a most remarkable showing when the fact is considered that the annual increase in the number of these vessels is enormous and that they are undoubtedly entering largely into commercial trade.

In the early history of these vessels they were operated almost entirely for pleasure, and but few of them were engaged in carrying freight or passengers for hire; but their adaptability and utility for nearly all commercial purposes in the way of marine transportation has encouraged their building and operation. If they are of 15 tons or less, they are subject to no inspection whatever and are not required to carry licensed officers, except in the case of carrying passengers for hire, when it is only necessary that they shall have a licensed operator and have a life preserver on board for each passenger carried. No examination is necessary under the law as a requisite for securing this "operator's" license, and we are now licensing the incompetency that we formerly deprecated and condemned. If these vessels are used for pleasure purposes only, they are exempted entirely from the restrictions applying to steam vessels, so far as inspection and carrying licensed officers are concerned, no matter what their size or the waters they navigate. If they are engaged in passenger service, the number of their passengers can not be restricted, as section 4464, Revised Statutes, governing this condition, applies only to steam vessels.

Vessels of any character of less than 5 tons are not licensed or enrolled by the customs authorities, and as a consequence there are thousands of motor boats under 5 tons that have no name and practically no identity whatever so far as the purposes of this Service are concerned, many of which are, no doubt, carrying passengers for hire, yet we have no record of these vessels and have no official knowledge of their existence.

In the annual report for the fiscal year ended June 30, 1909, pages 13 and 14, the motor-vessel question is referred to in the following language:

The number of motor vessels steadily increases, and it becomes more and more apparent that the jurisdiction of this Service must be extended in the direction of their supervision. While many persons operate motor vessels with considerable skill and care, it is nevertheless apparent that a large number of them make very poor students of the rules of navigation. Some of these by their carelessness endanger not only their own lives, but also the lives of persons traveling upon steam vessels, and in strenuous endeavors to avoid collision with them the licensed officers of steam vessels are sometimes forced to endanger the safety of their vessels.

In the annual report for the fiscal year ended June 30, 1910, pages 13 and 14, the following recommendation was made regarding the desirability for the inspection of motor vessels:

The time has come when every motor vessel, regardless of size and of the purpose for which used, should be inspected or examined by this Service. It is not proposed that there be made an inspection of so detailed a character as that at present required of steamers and other vessels subject to the jurisdiction of this Service, but that there be a sufficient inspection or examination to ascertain whether they are equipped with the proper lights and life-saving apparatus and the fuel tanks and engine are properly installed. It is believed that such an inspection would be a protection to the lives of both the persons who travel in motor boats and those who travel in other vessels, for while many of the operators of motor vessels are very expert, and are perfectly at home when navigating such vessels, the lives of persons traveling by other vessels are often

jeopardized by reason of the fact that many of the operators of motor vessels do not even know the rules of the road.

If a law were enacted which required inspectors of this Service to visit motor vessels, examine their equipment, and issue a certificate of inspection to the owners thereof, it would result also in protecting the owners of such boats from incurring the fine that is at present imposed for the violation of the act of June 9, 1910. This Service has observed that the operators or owners of motor vessels do not willfully violate the law so much as they do through ignorance of it, and as the purpose of modern government is to prevent violations thereof rather than to apprehend and punish the violators, it is believed that the persons who would be most protected by the proposed inspection are the owners and operators of such craft.

It has been noted also that some very small motor vessels are navigated upon routes for which they are not fitted. This is another feature of motor-boat navigation that should be controlled by authorizing this Service to designate the waters upon which certain craft may navigate.

At present the law requires that a motor boat carrying passengers for hire shall be in charge of a licensed operator. In my opinion the law should go a step further and require that every motor boat, whether used for pleasure, transportation of passengers or freight, or towing, be in charge of a licensed operator. Also all operators of motor boats shall be required to submit to examinations which would test their knowledge of the rules of the road, demonstrate that they are free from color-blindness, and ascertain whether they have had sufficient experience in the operation of such craft to justify the issuance of a license. At present the law does not require such an examination, and as a result the Service is placed in the peculiar position of legalizing the acts of many incompetent persons.

If the legislation suggested were enacted, it would be necessary to appoint in this Service additional inspectors and clerks, the services of the latter of whom would be required in making out the certificates of inspection that the Service proposes to give such motor boats, but the number would not be very large, and the increased safety to life would more than compensate for the extra cost incident to their employment.

In the annual report for the fiscal year ended June 30, 1911, reference is again made to the matter of the inspection of motor vessels, on page 14, as follows:

Reference has been made above to the licensing by this Service of persons who desire to become operators of motor vessels carrying passengers for hire under the provisions of the act of Congress approved June 9, 1910, which act also provides that any such license as operator of motor boats shall be revoked or suspended by the local board of inspectors for misconduct, gross negligence, recklessness in navigation, intemperance, or violation of law on the part of the holder, and while therefore the vast majority of motor boats are not subject to inspection, the Service does have a certain jurisdiction over persons holding licenses as operators of motor boats.

At present no examination is required as the condition of obtaining such license, and it must be apparent to anyone who gives the matter thought that many persons have received license to operate motor boats who are in fact not competent to hold such license and who jeopardize not only their own life and the lives of persons traveling with them, but also the lives of persons traveling on inspected steamers commanded by duly licensed men, and it does seem that as a matter of public policy, for the purpose of protecting life and property, the operators of motor boats should be required to pass a suitable examination before receiving license. One does not have to travel far from this city to observe instances of operators of motor boats violating the rules of the road and navigating their vessels without the proper lights and equipment, as required by the act of Congress approved June 9, 1910.

It should be stated, however, that the provisions of the act of Congress approved June 9, 1910, are now better understood, and it is believed that in the course of the next year or two the vast majority of persons owning motor boats will know at least certain principal rules with which they must comply in order not to violate the law.

In the annual report for the fiscal year ended June 30, 1912, page 18, attention is again invited to this matter, and the following recommendation made:

I have on previous occasions stated that motor vessels should be subject to the inspection of this Service, and I now again state that they should be subject to inspection. Could motor vessels be inspected and certificates of inspection issued to them, the result would be that the operators of motor vessels would know exactly what is

required to be carried on board of them, and I believe that the motor-vessel people themselves, could inspection be had, would support the efforts of this Service for safer conditions in this respect.

At the present time there is a most unjust competition between motor boats carrying passengers and small steamers carrying passengers, and the persons who own these steamers which are subject to inspection write asking why it is that motor boats may carry as many persons as can possibly be placed on board whereas the inspected steamers of only a little larger size are restricted to a very much smaller number. As the law at present stands, however, this Service can not correct a dangerous condition that will sooner or later result in loss of life and property.

METHODS OF REINSPECTION.

Under the present regulations of the Service every excursion and ferry steamer is required to be reinspected at least three times during the year for which the certificate of inspection was issued, or during the season of navigation. The making of these reinspections requires an increased expenditure in the operation of the Service, but the added expenditure is more than justified by the results obtained. It matters not how thorough the annual inspection may be, it is nevertheless true that it is peculiar to human nature that unless it is required to maintain the high standard at which it starts it will invariably permit that standard to be lowered. It has, therefore, proven most beneficial that the inspectors of this Service are required to make the numerous reinspections referred to.

It is not to be forgotten, however, that the inspectors themselves are human and that in order to maintain their highest efficiency it is necessary to have a rigorous "follow-up" system. This is done by the card system of reports which inspectors are required to make of every reinspection. As these cards are received in this office they are carefully examined, with a view of seeing, first of all, that the proper number of reinspections have been made, and next, that the reinspection has not been performed in a perfunctory manner, but that actually some good has come from it; and so much in detail has this system been worked out that the central office is now in a position to know the exact lifeboats and their positions on the vessels and the particular boats that were swung out in the test.

It may have been true that at one time reinspections were made in a perfunctory manner, but this office is making extraordinary efforts to overcome any such disposition on the part of inspectors in the field, and it is believed that it can be truthfully said that the inspectors of this Service are giving their personal and most careful attention to reinspections. It is also believed that the reinspection of vessels is as important, if not more important, than the annual inspection, and the Bureau will in no sense relax its discipline in the effort to maintain a high standard of inspection, to the end that the loss of life may be reduced to a minimum.

LICENSING OF MEN.

Reference has already been made to the licensing of officers of the American merchant marine. In issuing such licenses the inspectors have to have in mind not only the physical condition of those who receive license, but that they have the proper mental equipment to make them safe persons in whom to place the responsibility for the

navigation of vessels subject to inspection. The licensing of officers during the past fiscal year has been extensive, and while at first the available supply of third mates was not found large enough to meet the demand, it is believed that there is a sufficient number of third mates now to properly man all vessels to which that law applies.

The so-called seamen's bill has now been before Congress for some time, and it is to be recalled that in that bill there are provisions for the certificating of lifeboat men. While the provisions of that bill require that the local inspectors certificate these men and keep a list of the names of those to whom they issue certificates, it is also the plan of this office to have in the central office a complete list of all lifeboat men who receive certificates from this Service. The result will be that there will be available in Washington information of great value, and it is believed that should the said bill pass, so far as the administrative part of that plan is concerned, the Service should make extraordinary efforts to have it started correctly and to have kept in the office of the Supervising Inspector General the proper record of the certificates that are proposed to be issued. If this is done when the bill first becomes law, the records will be complete from the first, but if it is not done until later, extraordinary effort and unnecessary expense will be required to make the records complete.

INVESTIGATIONS.

Since your incumbency in the office of Secretary of Commerce this Bureau has, upon your direction, made extraordinary efforts to conduct investigations of disasters and violations of law. This policy will result in a marked increase in the expenditures of the Service, but the efficiency which will result will more than justify it. In the cases of the investigation of the loss of the steamer *Oklahoma* and the collision between the steamers *Monroe* and *Nantucket*, the local inspectors to whom this work was assigned demonstrated not only their fitness to inspect vessels and examine men but also to conduct investigations.

The system by which investigations and trials are held in this Service has been criticized from time to time, and there have been propositions put forward to change the old method of procedure, with the result, it will always be noted, of a marked and unnecessary increase in the expenditures of the Service. If it has been proven that the inspectors having jurisdiction are not competent to conduct investigations, then there exists necessity for a change in the procedure of the Service, but if not, then there is no reason for a change in the present procedure. However, a proof of the fitness of the local inspectors of this Service to conduct these investigations themselves was amply demonstrated in the cases of the vessels just cited.

These men are practical men who have actually had experience at sea, which, together with their education, makes them peculiarly fit to conduct such investigations. What is desired in such cases is not highly developed legal talent, but good practical common sense, which is something bound to appeal to the licensed officer who is on trial, and to business men generally.

TRANSPORTATION OF PERSONS.

In the annual report of the Supervising Inspector General for the fiscal year ended June 30, 1913, reference was made to the attention which had been given to precautions against the overloading of passenger steamers, showing, first of all, how this matter was taken care of by the certificates of inspection that are issued by inspectors, in which certificates the statement is made as to the number of persons that shall be carried on passenger steamers. The effort made in detecting the overloading of passengers after the issuance of the proper certificate was also pointed out. The inspectors of this service are giving their attention to the passenger-carrying allotment of these passenger and excursion steamers, and the number of passengers permitted to be carried to-day is relatively smaller than that permitted to be carried a few years ago. In any event, the original jurisdiction is placed by law in the hands of the local inspectors, and those are the officers who are responsible, and this Bureau has impressed upon those officers that they will be held strictly accountable in this respect.

During the past fiscal year there was put into use a new form for reporting the number of passengers carried. As these cards were received in the Bureau they were carefully examined, and in every instance where it appeared that there was any overloading, or a suspicion of it, the matter received prompt and immediate attention. It is not the steamers subject to inspection that violate the law, or on which danger exists in the matter of carrying passengers; where danger exists is on motor vessels not subject to inspection, and on motor vessels in some instances subject to inspection.

In this connection your attention is invited to the statement in the annual report of the Supervising Inspector General for the fiscal year ended June 30, 1907, where, on page 27, it was stated that under the present law there is no authority to restrict the number of passengers that may be carried on motor vessels other than steam. For the purpose of correcting this condition, it is recommended that section 4464, Revised Statutes, be amended to read as follows:

Sec. 4464. The inspectors shall state in every certificate of inspection granted to vessels carrying passengers, other than ferryboats, the number of passengers of each class that any such vessel has accommodations for and can carry with prudence and safety.

It will be noted that the recommendation substitutes the word "vessel" for "steamer."

Under present conditions, so far as relates to motor vessels, the situation is partly met by the equipment of these vessels; that is to say, the vessels are boated according to the number of persons they carry, but it must be obvious to anyone that this is an attempt to control a dangerous situation by indirect methods that are never satisfactory. Will it be necessary that there shall be some great catastrophe in order to eliminate the danger of carrying too many persons on motor boats? A change should be made in the law before this occurs. It seems to be the history of human nature that no great progress has been made except by the shedding of human blood. In the light of the past why is it necessary that this historical condition should be required to repeat itself? Therefore, your attention is urgently called to the matter so that the proper legislation may be at once brought before Congress, with a view to correcting this very dangerous condition.

PROTECTION IN TRANSPORTATION OF FREIGHT.

This Bureau has made heroic efforts to control as much as possible the matter of the transportation of dangerous articles on steamers carrying passengers, and if the Service is open to any criticism, it is that they have erred on the side of safety. Authority should be extended to give the Service control and jurisdiction over the transportation of dangerous articles on steamers that do not carry passengers. While from the commercial standpoint it may be said that there are no passengers on these freight vessels, it is nevertheless a fact that the Government owes a duty of protection to the crews on these vessels. It is also none the less a fact that by the carrying of dangerous articles in a dangerous manner on steamers that are not carrying passengers, the lives of those on passenger-carrying steamers may be jeopardized. The authority of the Steamboat-Inspection Service should, therefore, be so extended as to give jurisdiction over the transportation of dangerous articles on nonpassenger steamers.

WORK FOR OTHER DEPARTMENTS.

The work for other departments of the Government is rapidly increasing. There was a time when the number of requests for the inspection of boilers on United States vessels, in fortifications, power plants, etc., was relatively small, but such is not the case now, and this work by the Service is gladly done for the departments of the Government, the Service being, perhaps, better equipped to do this work than other branches of the Government. It is true, however, that as the requests for this kind of work increase the inspectors are feeling the pressure, and this is one of the reasons why it is necessary to have a larger number of inspectors. Not only do the inspectors of this Service inspect boilers that are already installed in Government plants, but numerous requests have been received for the inspection of material that is used in the construction of these boilers, and for the approval also of the blue prints of same. The inspection of Government boats is also increasing, and whereas in former times this inspection related almost entirely to boilers, now it is being requested also for the hulls.

EXTENSION OF THE SERVICE.

Reference has been made to the extension to which the details of hull inspection have been developed; of the extension to which the details of equipment have been developed, of the attention which inspectors are required to give not only to the approval of blue prints of boilers, but also to the following-up repairs that are ordered thereon, and in that connection not the least of which is the personal attention that inspectors should give to electric and oxy-acetylene welding. The desirability of extending the inspection of motor vessels has been pointed out, as has also the importance of reinspections, with the statement that the inspectors of this Service have not in all instances been able to make the reinspections or dry-dock examinations that are required. This is not the fault of the inspectors; this is not the fault of the system, but is due to the fact that the Service does not have a sufficiently large number of men to perform the work required. It is

useless to pass any more laws, or for the Board of Supervising Inspectors to go into any greater detail in the matter of the Rules and Regulations until Congress gives this Service a sufficiently large number of men to carry out in an intelligent manner the rules that already exist.

In some districts men are required to work from 5 o'clock in the morning until 10 or 11 o'clock at night. Such a thing should not be. Such a condition is wrong. For in a great, powerful, and rich Government such as ours certainly some arrangement should be made for giving a sufficient number of inspectors to properly perform their duties. If disasters occur as a result of lack of thoroughness, the responsibility will in the first instance not rest upon this Service, but upon Congress, and I am speaking thus plainly in order that the importance of this matter may be impressed upon Congress, because, as stated before, it does not appear to be necessary to have a great disaster occur before we take the necessary steps to prevent disaster.

If there is to be given to this Service the licensing of seamen, it is evident that there must be more work in the field service, and if we are to centralize and have uniform standards for the approval in this office of hull and boiler construction, there must be a larger number of men in the central office. Attention has been called to the excellent organization this Service has, and the splendid systems that have resulted in the fixing of responsibility, and of the centralization of authority, but systems are of no effect and organization amounts to nothing if we do not have the men to operate the machinery. The fact of the matter is that this Service is so organized as to be capable of indefinite expansion, but we are to-day up to the limit of endurance. The cry of this Service to-day is for more men, and unless we have more men I must honestly confess that the standard of inspection can not be maintained.

ADMINISTRATION OF THE SERVICE.

It is believed that the first principle of correct organization and administration is, first of all, to put one's own house in order. In 1910 the work of organizing the present clerical system was completed. That system has more than justified its existence. It is, of course, to be remembered that the Service does not exist for the system, but that the system exists for the Service, and that it is to be used as an instrument of discipline for effective organization. With it this office is in a position to have its hand upon the pulse of the entire field force. Without it this office was not in touch with the field service as it should have been. The last word has been said in the matter of organization and coordination in the office of the Supervising Inspector General. It has simply become a matter now of operating the machinery, but in order to do it successfully it will be necessary to have in this office more men, and hence in the estimates for the fiscal year ending June 30, 1916, two additional clerks have been asked for to be employed in the office of the Supervising Inspector General. Under the present conditions the men in this office are able to keep up the work when all are present, but it is a human requirement that men shall at times receive rest, and hence

when it becomes necessary for a man to take leave it means that an undue amount of pressure is imposed upon the remaining members of the force. This is a condition which should not be, and it can only be corrected by either destroying that which we have, and which has proven its value, or by having more men to operate this machinery which has been the means of the splendid and effective results that have been obtained.

DIVISION OF DISTRICTS.

During the past fiscal year there was established at Los Angeles Cal., a new board of local inspectors. As a result of this legislation the district of San Francisco, Cal., was divided so that two boards of local inspectors are now covering the territory that was once covered by one, with the result that more prompt attention is given to the business of the Service, and more detailed attention is given to inspection.

In the annual report of the Supervising Inspector General for the fiscal year ended June 30, 1913, reference was made to the necessity for dividing the first supervising inspection district, which district at present comprises the local boards of San Francisco, Cal., Los Angeles, Cal., Portland, Oreg., Seattle, Wash., St. Michael, Alaska, Juneau, Alaska, and Honolulu, Hawaii. The supervising inspector in charge of this district is stationed at San Francisco, Cal. It will thus be seen that this one officer has under his jurisdiction the entire Pacific coast and a good part of the Pacific Ocean. This officer is a capable, competent man, but does it need any argument to show that we are trying to require of one man the work of at least two, and does it need any argument to prove that it is not possible for one man in such a district as this to give that detailed attention to matters that is required and is necessary? It is again proposed that the first supervising inspection district be divided, and that a new district be created, to include the local inspection districts of Seattle, Wash., Portland, Oreg., Juneau, Alaska, and St. Michael, Alaska, with the supervising inspector of that district stationed at Seattle, Wash. Such an arrangement would leave in the old first supervising inspection district the local inspection districts of San Francisco, Cal., Los Angeles, Cal., and Honolulu, Hawaii, with the supervising inspector stationed at San Francisco, Cal.

BOARD OF SUPERVISING INSPECTORS.

The last annual meeting of the Board of Supervising Inspectors was unusually long, the meeting lasting from January 21, 1914, to April 20, 1914, but at that meeting much constructive work was done, and material progress was made in improving the inspection required. During the past fiscal year there were five meetings of executive committees of the Board of Supervising Inspectors.

Reference to the Board of Supervising Inspectors would not be complete were mention not made of the usefulness of this body. All of the members of the Board of Supervising Inspectors are practical men, and come to Washington from all parts of the country; and hence before approving rules, you, as the Secretary of the Department, are in a position to have the benefit of the expert opinions of

men from all parts of the country. In such a country as ours, where there are so many diversified interests and so many differing local conditions, it must be apparent to anyone who has given thoughtful attention to the matter that it is absolutely necessary to have a body familiar with these various local conditions, and also possessed of that practical knowledge which enables it to apply the proper remedies promptly and effectively.

INTERNATIONAL CONFERENCE ON SAFETY OF LIFE AT SEA.

I had the honor to be appointed one of the American delegates to attend the International Conference on Safety of Life at Sea in London, England. At that conference I had the opportunity to talk with the leading men of great maritime nations who were authorities on the subject of inspection and the licensing of officers, and I wish to state that it was most beneficial and enlightening to be able to meet face to face the men who are prosecuting in foreign countries the same work that we ourselves are engaged in in our own country. There were many things that I learned at that conference, and I was always comparing the standards of foreign countries with those of our own so far as the inspection of vessels is concerned, and I am persuaded as a result of what I heard and saw that the inspection of this Service is not one whit behind the inspection of foreign countries; in fact, I am persuaded that the American standard leads the world. The only thing to be regretted is that there are no more American ships engaged in the foreign trade to receive the excellent inspection given by this Service.

The results of the International Conference on Safety of Life at Sea have, as you know, been submitted to the President and to Congress, and the matter is now receiving the attention of Congress, and I have no doubt that at the appropriate time such legislation will be enacted as will be necessary to put into effect the recommendations of the conference. It is most beneficial to hold these conferences of international character, because as a result men engaged in the same kind of work in different countries are able, by reason of the ideas that are met and put forward, to forge the highest truth that shall be accepted as the standard for all nations. This form of procedure is most advantageous over a Government proceeding entirely by itself without the views of others, because in such cases we have only an ex parte judgment and not a truth that has been forged as a result of argument.

CONDITION OF THE SERVICE.

In the preceding pages a complete and exhaustive report on the facts relating to the work of this Service has been made. Inspection as it exists at present and its proposed improvement have been pointed out. Reference has been made to the licensing of officers and men, and to the transportation of persons and things. It has been pointed out that extraordinary efforts have been made in the conducting of investigations to maintain the standard of inspection and discipline, and the manner in which uniform results have been obtained has been shown. The conclusion of the whole matter is that the Steamboat-Inspection Service is in good condition. The fact has not been

forgotten that from time to time the Service has been vigorously attacked by its enemies, but the Service has stood these attacks, because the Bureau's policy and its faith have been implicit in the doctrine that the truth is bound to prevail in the end. There is nothing to hide, and the Bureau has at all times been willing to let the fierce sun of publicity shine down upon its work. If the Service is effective, then it shall be known by its fruits, and the results of its work have been that life has been protected and that travel by water is becoming safer. True it is that it may be pointed out that there has been loss of life in great storms, that there have been great disasters, but when these things are thoughtfully considered it must be admitted that many disasters have occurred because men have violated rules; and while it must be admitted that vessels have been lost by storm, man must not forget, in his colossal egotism, that God is greater than man, and that there is a power that is greater than all precautions that man may take to save life and property. It is none the less true, however, that man will always make intelligent efforts to save life and property, and that is the business in which this Service is engaged, and it is believed that it has well met its trust.

RECOMMENDATIONS.

In order that you may have before you a brief paragraph containing the gist of the changes that should be made, it is recommended that the system of issuing certificates of inspection be changed. It is not necessary to furnish vessels with the large number of copies of certificates required by present practice. The same purpose will be served if the local inspectors would furnish the original certificate direct to the vessel, supplying the collector or chief officer of customs with a copy. The result would be a saving in the number of copies of certificates of inspection used, and the original copy could be furnished the master or owner of the vessel, which should always have been the practice. It is recommended, therefore, that the law be amended in this respect.

From what has been said in this report it is evident that the name "Steamboat-Inspection Service" is not the proper designation for this Service. Its activities are too varied to be designated by such a narrow term, and as was recommended in my last annual report, it is believed that the necessary legislation should be introduced to the end that the name may be changed to "Marine-Inspection Service" instead of "Steamboat-Inspection Service," as at present.

It is recommended that section 4433, Revised Statutes, be amended so that the working pressure allowed steam boilers may be determined by the rules of the Board of Supervising Inspectors, so that the same may be modernized and brought up to date.

It is also recommended that careful attention be given to the drawing of a new motor-boat law, an act that shall be simply worded and easily understood, and something which may serve the purpose for which that act was passed, namely, the protection of life.

It is recommended that section 4464, Revised Statutes, be amended as has been hereinabove pointed out, so that the inspectors of this Service may more easily control the matter of the number of persons that shall be carried on vessels.

Section 4472, Revised Statutes, should be so amended as to widen the authority of the Steamboat-Inspection Service, to the end that it may have jurisdiction over the transportation of dangerous articles on nonpassenger steamers as well as on passenger steamers, as at present.

Proper legislation should be introduced looking to fireproof construction of excursion steamers, and it is so recommended.

And, lastly, it is believed that it would be in the interest of good administration to divide the first steamboat-inspection district.

APPENDIX.

There is attached hereto an appendix containing general statistics of the Service compiled from the reports of the supervising inspectors of the various districts for the year ended June 30, 1914, indicating the nature and extent of the work of the Service.^a

Respectfully,

GEO. UHLER,
Supervising Inspector General.

To Hon. WILLIAM C. REDFIELD,
Secretary of Commerce.

^a Appendix is published in the pamphlet edition of the report of the Supervising Inspector General, but omitted from this volume.

REPORT
OF THE
COMMISSIONER OF NAVIGATION

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REPORT OF THE COMMISSIONER OF NAVIGATION.

DEPARTMENT OF COMMERCE,
BUREAU OF NAVIGATION,
Washington, October 10, 1914.

SIR: There is submitted herewith my annual report for the fiscal year ended June 30, 1914.

STATISTICS FOR THE YEAR.

On June 30, 1914, the merchant marine of the United States, including all kinds of documented shipping, comprised 26,943 vessels of 7,928,688 gross tons. On June 30, 1913, it comprised 27,070 vessels of 7,886,518 gross tons. The following table shows the geographical distribution, motive power, material of construction, and trade of vessels of the United States for the fiscal year 1914 in comparison with similar data for the year 1913, and also the construction for the two years:

COMPARISON OF MERCHANT MARINE OF 1913 AND 1914.

| Classification. | 1913 | | 1914 | |
|-----------------------------------|----------------|--------------------|----------------|--------------------|
| | <i>Number.</i> | <i>Gross tons.</i> | <i>Number.</i> | <i>Gross tons.</i> |
| GEOGRAPHICAL DISTRIBUTION. | | | | |
| Atlantic and Gulf coasts..... | 16,924 | 3,743,354 | 16,767 | 3,795,522 |
| Porto Rico..... | 113 | 7,774 | 105 | 7,832 |
| Pacific coast..... | 4,577 | 1,028,550 | 4,778 | 1,084,640 |
| Hawaii..... | 48 | 20,746 | 43 | 16,336 |
| Northern lakes..... | 3,447 | 2,939,786 | 3,406 | 2,882,922 |
| Western rivers..... | 1,961 | 146,308 | 1,844 | 141,436 |
| Total..... | 27,070 | 7,886,518 | 26,943 | 7,928,688 |
| POWER AND MATERIAL. | | | | |
| Sail: | | | | |
| Wood..... | 6,901 | 1,238,594 | 6,317 | 1,165,401 |
| Metal..... | 144 | 269,036 | 142 | 267,139 |
| Total..... | 7,045 | 1,507,630 | 6,459 | 1,432,540 |
| Steam: | | | | |
| Wood..... | 12,929 | 1,106,773 | 13,272 | 1,061,348 |
| Metal..... | 2,154 | 4,226,269 | 2,219 | 4,346,178 |
| Total..... | 15,083 | 5,335,541 | 15,491 | 5,427,526 |
| Canal, wood..... | 608 | 76,619 | 700 | 76,454 |
| Barges: | | | | |
| Wood..... | 4,066 | 863,626 | 4,091 | 872,558 |
| Metal..... | 188 | 113,102 | 202 | 119,610 |
| Total..... | 4,244 | 966,728 | 4,293 | 992,168 |
| Grand total..... | 27,070 | 7,886,518 | 26,943 | 7,928,688 |

COMPARISON OF MERCHANT MARINE OF 1913 AND 1914—Continued.

| Classification. | 1913 | | 1914 | |
|--------------------------------------|---------|-------------|---------|-------------|
| | Number. | Gross tons. | Number. | Gross tons. |
| TRADE. | | | | |
| Registered: | | | | |
| Sail— | | | | |
| Wood..... | 475 | 203,063 | 455 | 205,061 |
| Metal..... | 21 | 36,922 | 16 | 24,488 |
| Total..... | 496 | 239,975 | 472 | 229,569 |
| Steam— | | | | |
| Wood..... | 656 | 81,287 | 705 | 83,373 |
| Metal..... | 171 | 599,861 | 179 | 641,501 |
| Total..... | 827 | 671,148 | 884 | 724,874 |
| Barges— | | | | |
| Wood..... | 965 | 110,658 | 1,083 | 116,378 |
| Metal..... | 17 | 5,965 | 16 | 5,331 |
| Total..... | 982 | 116,653 | 1,049 | 121,709 |
| Total registered..... | 2,305 | 1,027,776 | 2,405 | 1,076,153 |
| Enrolled and licensed: | | | | |
| Sail— | | | | |
| Wood..... | 6,426 | 1,085,541 | 5,861 | 980,330 |
| Metal..... | 123 | 232,114 | 126 | 242,651 |
| Total..... | 6,549 | 1,267,655 | 5,987 | 1,202,971 |
| Steam— | | | | |
| Wood..... | 12,273 | 1,027,965 | 12,567 | 997,975 |
| Metal..... | 1,983 | 3,636,398 | 2,040 | 3,704,677 |
| Total..... | 14,256 | 4,664,393 | 14,607 | 4,702,652 |
| Canal, wood..... | 698 | 76,619 | 700 | 76,454 |
| Barges— | | | | |
| Wood..... | 3,092 | 742,968 | 3,058 | 756,180 |
| Metal..... | 170 | 107,107 | 186 | 114,279 |
| Total..... | 3,260 | 850,075 | 3,244 | 870,459 |
| Total enrolled and licensed..... | 24,765 | 6,868,742 | 24,638 | 6,862,636 |
| Grand total..... | 27,070 | 7,896,518 | 26,943 | 7,928,688 |
| CONSTRUCTION DURING THE YEAR. | | | | |
| <i>Geographical distribution.</i> | | | | |
| Atlantic and Gulf coasts..... | 597 | 202,394 | 554 | 215,141 |
| Porto Rico..... | 14 | 260 | 3 | 64 |
| Pacific coast..... | 409 | 44,589 | 330 | 36,420 |
| Hawaii..... | 2 | 75 | 2 | 75 |
| Northern lakes..... | 219 | 90,907 | 130 | 56,541 |
| Western rivers..... | 234 | 7,980 | 132 | 8,006 |
| Total..... | 1,475 | 346,155 | 1,151 | 316,260 |
| <i>Power and material.</i> | | | | |
| Sail: | | | | |
| Wood..... | 66 | 15,610 | 51 | 13,749 |
| Metal..... | 6 | 13,000 | ..... | ..... |
| Total..... | 72 | 28,610 | 51 | 13,749 |
| Steam: | | | | |
| Wood..... | 900 | 37,723 | 677 | 26,614 |
| Metal..... | 104 | 205,685 | 101 | 195,611 |
| Total..... | 1,004 | 243,408 | 778 | 224,225 |
| Canal, wood..... | 39 | 4,641 | 25 | 2,568 |
| Barges: | | | | |
| Wood..... | 339 | 56,509 | 276 | 65,898 |
| Metal..... | 21 | 12,987 | 21 | 9,820 |
| Total..... | 360 | 69,496 | 297 | 75,718 |
| Total construction..... | 1,475 | 346,155 | 1,151 | 316,260 |

ANALYSIS OF THE YEAR'S CONSTRUCTION.

During the past fiscal year 1,151 vessels of 316,250 gross tons were built and documented in the United States, compared with 1,475 vessels of 346,155 gross tons for the previous year. This slight decrease had not been anticipated.

The salient features of the year's construction readily appear from the following table of vessels of 1,000 gross tons or upward built and documented during the year. These 46 vessels aggregate 59 per cent of the total construction of the United States.

VESSELS OF 1,000 GROSS TONS AND OVER BUILT IN THE UNITED STATES AND DOCUMENTED DURING THE YEAR ENDED JUNE 30, 1914.

| Name. | Gross tons. | Where built. | Name. | Gross tons. | Where built. |
|--------------------------------|----------------|---------------------|---|----------------|------------------|
| SEABOARD. | | | SEABOARD—contd. | | |
| <i>Steel steamers.</i> | | | <i>Wooden schooners—Continued.</i> | | |
| <i>Matsonia</i> | 9,728 | Newport News, Va. | <i>Courtney C. Houck</i> | 1,627 | Bath, Me. |
| <i>John D. Archbold</i> | 8,374 | Do. | <i>Irene</i> | 1,206 | Do. |
| <i>Congress</i> | 7,985 | Camden, N. J. | Total (4)..... | 6,462 | |
| <i>Manoa</i> | 6,805 | Newport News, Va. | <i>Steel barge.</i> | | |
| <i>Iowan</i> | 6,649 | Sparrow Point, Md. | <i>N.Y., P. & N. R. R. No. 18</i> | 1,505 | Camden, N. J. |
| <i>Ohioan</i> | 6,649 | Do. | GREAT LAKES. | | |
| <i>Panaman</i> | 6,649 | Do. | <i>Steel steamers, Lake trade.</i> | | |
| <i>Washingtonian</i> | 6,649 | Do. | <i>Alton C. Dustin</i> | 7,978 | Lorain, Ohio. |
| <i>Richmond</i> | 6,633 | Quincy, Mass. | <i>Robert L. Ireland</i> | 6,387 | Do. |
| <i>Santa Catalina</i> | 6,309 | Philadelphia, Pa. | <i>William D. Crawford</i> | 6,385 | Do. |
| <i>Santa Cecilia</i> | 6,309 | Do. | <i>Howard M. Hanna, Jr.</i> | 6,204 | Cleveland, Ohio. |
| <i>Santa Clara</i> | 6,309 | Do. | <i>Huron</i> | 4,810 | Ecorse, Mich. |
| <i>Frank H. Buck</i> | 6,076 | San Francisco, Cal. | <i>South American</i> | 2,662 | Do. |
| <i>Topila</i> | 5,125 | Newport News, Va. | <i>Adrian Iselin</i> | 2,072 | Wyandotte, Mich. |
| <i>Hampden</i> | 4,725 | Camden, N. J. | <i>Hydro</i> | 1,282 | Manitowoc, Wis. |
| <i>Tyler</i> | 3,928 | Do. | Total (8)..... | 37,780 | |
| <i>Manhattan</i> | 3,839 | Wilmington, Del. | <i>Steel steamers, ocean trade.</i> | | |
| <i>Narragansett</i> | 3,839 | Do. | <i>Radiant</i> | 2,487 | |
| <i>Lewis K. Thurlow</i> | 3,178 | Newport News, Va. | <i>Brilliant</i> | 2,486 | |
| <i>Amolco</i> | 3,074 | Quincy, Mass. | <i>Comet</i> | 2,486 | |
| <i>Alameda</i> | 2,802 | Oakland, Cal. | Total (3)..... | 7,459 | |
| <i>City of Annapolis</i> | 1,923 | Sparrow Point, Md. | Grand total (46)..... | 187,448 | |
| <i>City of Richmond</i> | 1,923 | Do. | | | |
| <i>Mayor Gaynor</i> | 1,634 | Camden, N. J. | | | |
| <i>Edward T. Jeffery</i> | 1,678 | Oakland, Cal. | | | |
| <i>Alvarado</i> | 1,622 | Long Beach, Cal. | | | |
| <i>Aroline</i> | 1,456 | San Francisco, Cal. | | | |
| <i>Catakill</i> | 1,400 | Newburgh, N. Y. | | | |
| <i>Bayonne</i> | 1,334 | Wilmington, Del. | | | |
| Total (29)..... | 133,234 | | | | |
| <i>Wooden steamer.</i> | | | | | |
| <i>Wilmington</i> | 1,008 | North Bend, Oreg. | | | |
| <i>Wooden schooners.</i> | | | | | |
| <i>Penn.</i> | 1,849 | Bath, Me. | | | |
| <i>Exeter</i> | 1,780 | Noank, Conn. | | | |

Seven of these steamers, the *Iowan*, *Ohioan*, *Panaman*, *Washingtonian*, *Santa Catalina*, *Santa Cecilia*, and *Santa Clara*, are built for the Panama Canal trade, and the *Matsonia*, 9,728 tons, *Congress*, 7,985 tons, and the *Manoa*, 6,805 tons, are designed for use on the Pacific coast.

The summary following of vessels just named in the preceding table and of vessels of over 1,000 gross tons built during the preceding four years shows the changes in the larger form of construction for the five-year period.

COMPARISON OF VESSELS OF 1,000 GROSS TONS AND OVER BUILT, 1910-1914.

| Type. | 1910 | | 1911 | | 1912 | | 1913 | | 1914 | |
|--|-----------|----------------|-----------|----------------|-----------|----------------|-----------|----------------|-----------|----------------|
| | No. | Gr. tons. | No. | Gr. tons. | No. | Gr. tons. | No. | Gr. tons. | No. | Gr. tons. |
| Seaboard. | 18 | 78,845 | 18 | 76,490 | 8 | 22,672 | 29 | 105,250 | 29 | 133,234 |
| Ocean steel steamers..... | | | | | | | | | | |
| Steel ferryboats, steam dredges, river and bay steamers..... | 2 | 3,800 | 8 | 14,463 | | | 5 | 10,829 | | |
| Wooden steamers..... | 1 | 1,083 | 3 | 3,320 | 1 | 2,604 | 3 | 3,285 | 1 | 1,008 |
| Wooden schooners..... | 2 | 4,786 | 1 | 1,362 | 5 | 7,581 | 2 | 2,414 | 4 | 6,462 |
| Steel schooners..... | 1 | 1,280 | 1 | 1,280 | | | | | | |
| Steel unrigged vessels..... | 2 | 2,401 | 1 | 1,133 | | | | | 1 | 1,505 |
| Total..... | 26 | 92,185 | 32 | 98,048 | 14 | 32,857 | 39 | 121,786 | 35 | 142,209 |
| Great Lakes: | | | | | | | | | | |
| Steel steamers, Lake trade. | 27 | 142,521 | 14 | 71,276 | 10 | 52,667 | 9 | 41,582 | 8 | 37,780 |
| Steel unrigged vessels..... | | | | | 2 | 2,402 | 1 | 2,065 | | |
| Steel steamers, ocean trade..... | | | | | 10 | 23,806 | 7 | 17,270 | 3 | 7,450 |
| Steel schooner barges, ocean trade..... | | | | | 2 | 4,057 | 5 | 12,225 | | |
| Total..... | 27 | 142,521 | 14 | 71,276 | 24 | 82,932 | 22 | 73,142 | 11 | 45,230 |
| Grand total..... | 53 | 234,706 | 46 | 169,324 | 38 | 115,789 | 61 | 194,928 | 46 | 187,448 |

CONSTRUCTION DURING THE CURRENT FISCAL YEAR.

At the beginning of the current fiscal year indications clearly pointed to a diminished output for the fiscal year from American shipyards on the seaboard. In consequence of the European war the construction of merchant vessels in Germany has ceased, and even in Great Britain such work has been delayed in order that work on war vessels could be pushed to completion. The output of foreign shipyards for the year will undoubtedly be less than usual. There have been some merchant vessels actually destroyed on account of the war. Lessened production and the loss of vessels will be more than offset, however, by the great reduction in the volume of international trade by sea during the war and during the period of recuperation which must follow, whatever the duration of the war may be. Accordingly, shipbuilding, both here and abroad, is not likely to be active during the remainder of the year. These general causes are briefly noted last months hence a diminished domestic production should be attributed mistakenly to the ship-registry act of August 18, 1914.

The present and recent conditions of the steel shipbuilding industry in the United States are shown by the following table, giving the number and tonnage of steel vessels under construction or contracted for on the dates mentioned:

COMPARISON OF VESSELS BUILDING, 1900-1914.

| Date. | Merchant. | | | | Government. | | Total. | |
|--------------------|-----------|-----------|-----------|-----------|-------------|---------|--------|---------|
| | Lake. | | Seaboard. | | | | | |
| | No. | Gr. tons. | No. | Gr. tons. | No. | Tons. a | No. | Tons. |
| Aug. 15, 1900..... | 20 | 70,119 | 48 | 207,561 | 47 | 113,329 | 115 | 391,009 |
| June 15, 1901..... | 26 | 81,780 | 63 | 273,865 | 71 | 281,148 | 180 | 636,793 |
| July 1, 1902..... | 39 | 124,537 | 65 | 222,949 | 67 | 269,890 | 171 | 617,376 |
| July 1, 1903..... | 30 | 100,020 | 58 | 146,655 | 47 | 334,147 | 135 | 580,822 |
| July 1, 1904..... | 1 | 400 | 56 | 94,588 | 38 | 331,435 | 95 | 426,423 |
| July 1, 1905..... | 27 | 104,067 | 49 | 86,836 | 39 | 306,702 | 115 | 490,605 |
| July 1, 1906..... | 33 | 175,472 | 78 | 159,290 | 29 | 237,814 | 140 | 572,586 |
| July 1, 1907..... | 50 | 283,949 | 84 | 149,524 | 45 | 151,993 | 179 | 555,466 |
| July 1, 1908..... | | | 13 | 14,775 | 82 | 136,091 | 95 | 150,866 |
| July 1, 1909..... | 13 | 41,395 | 52 | 127,453 | 62 | 164,184 | 117 | 333,032 |
| July 1, 1910..... | 36 | 59,662 | 63 | 86,075 | 45 | 184,096 | 144 | 329,863 |
| July 1, 1911..... | 53 | 71,769 | 26 | 28,626 | 130 | 119,449 | 209 | 219,844 |
| July 1, 1912..... | 51 | 78,353 | 80 | 192,980 | 85 | 234,923 | 216 | 506,236 |
| July 1, 1913..... | 63 | 40,849 | 71 | 169,580 | 123 | 286,673 | 267 | 441,182 |
| July 1, 1914..... | 17 | 39,337 | 24 | 104,631 | 58 | 142,910 | 99 | 286,873 |

a Displacement.

In accord with the custom of the Bureau for some years past, American builders of steel vessels were requested to make a return showing the steel merchant vessels under contract or under construction at their respective establishments at the beginning of the current fiscal year. The Navy Department, the Revenue-Cutter Service, the Bureau of Lighthouses, and other branches of the Government engaged in operating vessels for public purposes were requested to furnish a similar statement of vessels building or under contract in private yards for their service on that date. The details of these statements are tabulated in Appendix E. The following is a summary:

NUMBER AND TONNAGE OF STEEL MERCHANT AND GOVERNMENT VESSELS UNDER CONSTRUCTION IN AMERICAN SHIPYARDS ON JULY 1, 1914, WITH CAPITAL INVESTED AND MEN EMPLOYED.

| | Capital. | Men. | Merchant ships building. | | Government vessels building. | | Merchant capacity. | |
|--|---------------------|---------------|--------------------------|---------------|------------------------------|----------------|--------------------|-----------------|
| | | | No. | Tons. | No. | Tons. | No. | Tons. |
| SEACOAST. | | | | | | | | |
| <i>Merchant and Government.</i> | | | | | | | | |
| William Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa. | \$17,128,000 | 4,500 | 3 | 23,800 | 5 | 5,330 | (a) | (a) |
| Newport News Shipbuilding & Dry Dock Co., Newport News, Va. | (a) | 5,000 | 4 | 23,974 | 1 | 31,400 | 10 | (a) |
| Fore River Shipbuilding Corporation, Quincy, Mass. | 5,000,000 | 3,570 | 2 | 10,660 | 3 | 29,640 | 12 | 60,000 |
| New York Shipbuilding Co., Camden, N. J. | 10,000,000 | 3,500 | 5 | 28,620 | 6 | 39,112 | 10 | 50,000 |
| Ellicott Machine Corporation, Baltimore, Md. | 650,000 | 325 | 1 | 650 | 3 | 3,402 | 4 | 6,000 |
| Staten Island Shipbuilding Co., Port Richmond, N. Y. | (a) | 700 | 3 | 806 | 2 | 1,456 | (a) | (a) |
| Total | \$32,778,000 | 17,595 | 18 | 88,510 | 20 | 110,340 | 336 | 3116,000 |
| <i>Merchant only.</i> | | | | | | | | |
| Harlan & Hollingsworth Corporation, Wilmington, Del. | 1,750,000 | 1,800 | 3 | 3,678 | ..... | ..... | 15 | 1,500 |
| Union Iron Works, San Francisco, Cal. | (a) | (a) | 2 | 12,076 | ..... | ..... | (a) | (a) |
| Pusey & Jones, Wilmington, Del. | (a) | (a) | 1 | 367 | ..... | ..... | (a) | (a) |
| Total | \$1,750,000 | 3,600 | 6 | 16,121 | ..... | ..... | 15 | 3,500 |
| <i>Government only.</i> | | | | | | | | |
| Bath Iron Works, Bath, Me. | 900,000 | 800 | ..... | ..... | 1 | 1,060 | 4 | 8,000 |
| Lake Torpedo Boat Co., Bridgeport, Conn. | 5,000,000 | 250 | ..... | ..... | 3 | (a) | 6 | 5,000 |
| Electric Boat Co.: | | | | | | | | |
| Quincy, Mass. | (a) | (a) | ..... | ..... | 9 | (a) | (a) | (a) |
| San Francisco, Cal. | (a) | (a) | ..... | ..... | 3 | (a) | (a) | (a) |
| Seattle, Wash. | (a) | (a) | ..... | ..... | 1 | (a) | (a) | (a) |
| Craig Shipbuilding Co., Long Beach, Cal. | (a) | (a) | ..... | ..... | 2 | (a) | (a) | (a) |
| New London Ship & Engine Co., Groton, Conn. | (a) | (a) | ..... | ..... | 1 | 1,408 | (a) | (a) |
| Seattle Construction & Dry Dock Co., Seattle, Wash. | (a) | 1,000 | ..... | ..... | 1 | 3,580 | 8 | 32,000 |
| Valk & Murdock Co., Charleston, S. C. | (a) | (a) | ..... | ..... | 1 | 250 | (a) | (a) |
| Spedden Shipbuilding Co., Baltimore, Md. | (a) | 250 | ..... | ..... | 2 | 1,168 | (a) | (a) |
| Maryland Steel Co., Sparrow Point, Md. | 2,000,000 | 1,300 | ..... | ..... | 2 | 21,300 | 7 | 35,000 |
| Hall Bros. Marine Railway & Shipbuilding Co., Winslow, Wash. | (a) | (a) | ..... | ..... | 1 | 238 | (a) | (a) |
| Total | \$7,900,000 | 3,600 | ..... | ..... | 27 | 329,004 | 325 | 380,000 |
| GREAT LAKES AND WESTERN RIVERS. | | | | | | | | |
| American Shipbuilding Co.: | | | | | | | | |
| Lorain, Ohio. | (a) | 700 | 3 | 13,653 | ..... | ..... | 11 | 50,000 |
| Cleveland, Ohio. | (a) | 1,100 | 1 | 6,204 | ..... | ..... | 3 | 18,800 |
| Great Lakes Engineering Co., Detroit, Mich. | 4,500,000 | 2,000 | 5 | 16,300 | ..... | ..... | 10 | 60,000 |
| Cowles Shipyard Co., Buffalo, N. Y. | (a) | 20 | 2 | 110 | ..... | ..... | (a) | (a) |
| James Rees & Sons Co., Pittsburgh, Pa. | (a) | 125 | 2 | 625 | ..... | ..... | (a) | (a) |

^a Not reporting.

^b Incomplete.

NUMBER AND TONNAGE OF STEEL MERCHANT AND GOVERNMENT VESSELS UNDER CONSTRUCTION IN AMERICAN SHIPYARDS ON JULY 1, 1914, WITH CAPITAL INVESTED AND MEN EMPLOYED—Continued.

| | Capital. | Men. | Merchant ships building. | | Government vessels building. | | Merchant capacity. | |
|--|-------------|---------|--------------------------|---------|------------------------------|----------|--------------------|----------|
| | | | No. | Tons. | No. | Tons. | No. | Tons. |
| GREAT LAKES AND WESTERN RIVERS—CON. | | | | | | | | |
| Manitowoc Shipbuilding & Dry Dock Co., Manitowoc, Wis. | (a) | 400 | 1 | 2,200 | | | (a) | 5,000 |
| Johnson Bros., Ferrysburg, Mich. | 150,000 | 150 | 3 | 245 | | | 5 | 1,000 |
| Dubuque Boat & Boiler Works, Dubuque, Iowa. | 100,000 | 125 | | | 3 | 1,610 | (a) | (a) |
| Sweeney Shipyard & Foundry Co., Jeffersonville, Ind. | (a) | (a) | | | 1 | 300 | (a) | (a) |
| Ed. J. Howard, Jeffersonville, Ind. | (a) | (a) | | | 4 | 836 | (a) | (a) |
| Rock Island Bridge & Iron Works, Burlington, Iowa. | (a) | (a) | | | 1 | 300 | (a) | (a) |
| Racine-Truscott-Shell Lake Boat Co., Muskegon, Mich. | (a) | (a) | | | 2 | 520 | (a) | (a) |
| Total..... | b4,750,000 | b4,620 | 17 | 39,337 | 11 | 3,566 | b29 | b134,800 |
| REPORTING NO VESSELS UNDER CONSTRUCTION. | | | | | | | | |
| Johnson Iron Works, New Orleans, La. | (a) | (a) | | | | | (a) | (a) |
| Skinner Shipbuilding & Dry Dock Co., Baltimore, Md. | (a) | (a) | | | | | (a) | (a) |
| Hartmann-Grelling Co., Green Bay, Wis. | (a) | (a) | | | | | (a) | (a) |
| Buffalo Dry Dock Co., Buffalo, N. Y. | (a) | 300 | | | | | 4 | 20,000 |
| Detroit Shipbuilding Co., Detroit, Mich. | 2,000,000 | 166 | | | | | 5 | 35,000 |
| Chicago Shipbuilding Co., Chicago, Ill. | (a) | 200 | | | | | 8 | 50,000 |
| Willamette Iron & Steel Works, Portland, Ore. | (a) | (a) | | | | | (a) | (a) |
| United Engineering Co., San Francisco, Cal. | (a) | 600 | | | | | 3 | 6,000 |
| James Davidson, Bay City, Mich. | (a) | (a) | | | | | (a) | (a) |
| Milwaukee Bridge Co., Milwaukee, Wis. | (a) | (a) | | | | | (a) | (a) |
| Superior Shipbuilding Co., Superior, Wis. | (a) | (a) | | | | | (a) | (a) |
| Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa. | (a) | (a) | | | | | (a) | (a) |
| Merrill-Stevens Co., Jacksonville, Fla. | 600,000 | 500 | | | | | (a) | (a) |
| Quintard Iron Works Co., New York, N. Y. | (a) | (a) | | | | | (a) | (a) |
| Downey Marine Co., Brooklyn, N. Y. | (a) | (a) | | | | | (a) | (a) |
| Charles Barnes, Cincinnati, Ohio. | (a) | (a) | | | | | (a) | (a) |
| Bath Marine Construction Co., Bath, Me. | (a) | (a) | | | | | (a) | (a) |
| Toledo Shipbuilding Co., Toledo, Ohio. | 2,250,000 | 100 | | | | | 5 | 18,000 |
| The Atlantic Works, Boston, Mass. | (a) | (a) | | | | | (a) | (a) |
| Arthur Sewall & Co., Bath, Me. | (a) | (a) | | | | | (a) | (a) |
| Clinton Shipbuilding Co., Philadelphia, Pa. | (a) | (a) | | | | | (a) | (a) |
| Total..... | b4,850,000 | b1,866 | | | | | b25 | b129,000 |
| SUMMARY. | | | | | | | | |
| Seacoast: | | | | | | | | |
| Merchant and Government..... | 32,778,000 | 17,565 | 18 | 88,510 | 20 | 110,340 | 36 | 116,000 |
| Merchant only..... | 1,750,000 | 1,800 | 6 | 16,121 | | | 15 | 1,500 |
| Government only..... | 7,900,000 | 3,600 | | | 27 | 29,004 | 25 | 80,000 |
| Great Lakes and western rivers..... | 4,750,000 | 4,620 | 17 | 39,337 | 11 | 3,566 | 29 | 134,800 |
| No construction..... | 4,850,000 | 1,866 | | | | | 25 | 129,000 |
| Total..... | b52,028,000 | b29,481 | 41 | 143,968 | 58 | b142,910 | b130 | b461,300 |

• Not reporting.

• Incomplete.

Besides the Navy vessels included in the table above, the battleship *No. 39*, 31,400 tons displacement, is being built at the New York Navy Yard. One submarine is being built at the Portsmouth (N. H.) Navy Yard; two fuel ships, of 14,500 tons displacement each, at the Mare Island (Cal.) Navy Yard; a supply ship, of 8,500 tons displacement, at the Boston Navy Yard; and a transport ship, of 10,000 tons displacement, at the Philadelphia Navy Yard. At the Charleston (S. C.) Navy Yard a tug, of 50 tons displacement, and a hydraulic pipe-line dredge are being constructed for the Engineer Department, United States Army. The Revenue-Cutter Service reports that in

the near future contracts will be awarded for the construction of two single-screw steel steamers, of approximately 900 tons displacement and 12 knots speed.

ENFORCEMENT OF THE NAVIGATION LAWS.

From the beginning of government the enforcement of the laws relating to merchant shipping and navigation has been intrusted to collectors of customs, and those officers still exercise powers bestowed upon them by the original act of September 1, 1789, "for registering and clearing vessels, regulating the coasting trade, and for other purposes." Section 10 of the act of February 14, 1903, which created the Department of Commerce and Labor (since March 4, 1913, the Department of Commerce), provides:

All duties, power, authority and jurisdiction, whether supervisory, appellate or otherwise, now imposed or conferred upon the Secretary of the Treasury by Acts of Congress relating to merchant vessels or yachts, their measurement, numbers, names, registers, enrollments, licenses, commissions, records, mortgages, bills of sale, transfers, entry, clearance, movements and transportation of their cargoes and passengers, owners, officers, seamen, passengers, fees, inspection, equipment for the better security of life, and by Acts of Congress relating to tonnage tax, boilers on steam vessels, the carrying of inflammable, explosive or dangerous cargo on vessels, the use of petroleum or other similar substances to produce motive power and relating to the remission or refund of fines, penalties, forfeitures, exactions or charges incurred for violating any provision of law relating to vessels or seamen or to informer's shares of such fines, and by Acts of Congress relating to the Commissioner and Bureau of Navigation, Shipping Commissioners, their officers and employees, Steamboat-Inspection Service and any of the officials thereof, shall be and hereby are transferred to and imposed and conferred upon the Secretary of Commerce and Labor from and after the time of the transfer of the Bureau of Navigation, the Shipping Commissioners and the Steamboat-Inspection Service to the Department of Commerce and Labor, and shall not thereafter be imposed upon or exercised by the Secretary of the Treasury. And all Acts or parts of Acts inconsistent with this Act are, so far as inconsistent, hereby repealed.

The field force of the Department of Commerce for the administration of laws relating to shipping and navigation comprises, accordingly, the collectors of customs, the steamboat-inspection force, the radio-inspection force, the shipping commissioners, and the inspection force connected with the motor boat *Tarragon*. To this force have now been added the inspectors provided for by the general deficiency appropriation act of July 29, 1914. The Revenue-Cutter Service renders useful assistance in the enforcement of the navigation laws in various directions.

During the fiscal year ended June 30, 1914, 6,720 violations of the navigation laws were reported to the Department, nearly double the number reported during any previous fiscal year. These violations may be divided for convenience into two general classes: First, those which are discoverable when the vessel in question is at the dock, and second, those which are discoverable only while the vessel is under way. The second class, which as a rule involves more imminent risk to safety, has received the special attention of the Department of Commerce since Congress first four years ago appropriated the means to carry on the enforcement of the laws upon the water. Of the 6,720 violations of law reported, 3,275 were reported by collectors of customs, of which number 1,325 were reported under the appropriations just referred to; 1,762 were reported by the motor boat *Tarragon*, which made a thorough inspection of the Atlantic coast from Key West, Fla., to Eastport, Me., visiting nearly every harbor, bay, and sound along the coast and entering a number of the rivers. The Revenue-

Cutter Service reported 922 violations, the local inspectors of steam vessels 734, and the radio inspectors 27.

The following is a statement of violations of navigation laws reported by the various collectors of customs showing the laws violated and the work done by the Revenue-Cutter Service, the motor boat *Tarragon*, local inspectors of steam vessels, radio inspectors and customs officers, the work of the customs officers under allotments made by the Department being shown in the last column of the second half of this tabulation:

| Port. | Total. | Steamboat laws (4390-4600, R. S.). | Motor-boat law "Rules of road." | Surrendered license (4323-4326, R. S.). | Bills of health (Feb. 15, 1898). ^a | Anchorage and St. Marys River rules. | Passenger act (Aug. 2, 1882). | Enrollment and license (4336, R. S.). | Entry and clearance (4197, 2774, R. S.). | Name on vessel (4178, R. S.). | Change of master (4336, R. S.). | Unloading. | Radio-communication laws. | Miscellaneous. |
|------------------------------|--------|------------------------------------|---------------------------------|---|---|--------------------------------------|-------------------------------|---------------------------------------|--|-------------------------------|---------------------------------|------------|---------------------------|----------------|
| Baltimore, Md. | 219 | 45 | 130 | 17 | | | | 2 | | 20 | 3 | 1 | 1 | ... |
| Boston, Mass. | 949 | 40 | 868 | 27 | | | 4 | | 2 | | 1 | 2 | 5 | ... |
| Bridgeport, Conn. | 134 | 7 | 104 | 18 | | | | | | 3 | | 2 | | ... |
| Buffalo, N. Y. | 3 | 1 | 1 | | | | | | | | | | 1 | ... |
| Burlington, Vt. | 54 | | 54 | | | | | | | | | | | ... |
| Charleston, S. C. | 154 | 12 | 104 | 32 | | | | | | 3 | 2 | 1 | | ... |
| Chicago, Ill. | 105 | 14 | 82 | 6 | | 1 | | 2 | | | | | | ... |
| Cleveland, Ohio. | 90 | | 66 | 15 | | | | | 3 | | 1 | 5 | | ... |
| Des Moines, Iowa. | 160 | | 139 | 19 | | | | | | 2 | | | | ... |
| Detroit, Mich. | 112 | 4 | 75 | 8 | | 7 | | 1 | | 1 | 1 | 10 | | 5 |
| Duluth, Minn. | 17 | 1 | 11 | 4 | | | | | | | 1 | | | ... |
| Eagle Pass, Tex. | 2 | | 2 | 2 | | | | | 1 | 2 | 1 | 1 | | ... |
| Galveston, Tex. | 49 | 24 | 17 | 3 | | | | | 1 | 4 | 1 | 1 | | ... |
| Honolulu, Hawaii. | 15 | 1 | 3 | 1 | | | | | 1 | 4 | 1 | 4 | | ... |
| Indianapolis, Ind. | 1 | | | | | | | | | | | | | ... |
| Jacksonville, Fla. | 669 | 20 | 517 | 85 | | | | 4 | | 16 | 10 | 9 | | 8 |
| Juneau, Alaska. | 41 | 5 | 2 | 23 | | | | 5 | 2 | 2 | 2 | | | ... |
| Laredo, Tex. | 14 | | 8 | 5 | | | | | | | 1 | | | ... |
| Los Angeles, Cal. | 79 | 6 | 53 | 9 | | | | | 4 | 4 | | 1 | | 2 |
| Louisville, Ky. | 41 | | 33 | 8 | | | | | | | | | | ... |
| Memphis, Tenn. | 10 | | 2 | 8 | | | | | | | | | | ... |
| Milwaukee, Wis. | 16 | 3 | 7 | 2 | | | | 1 | | 2 | | | 1 | ... |
| Mobile, Ala. | 157 | 4 | 115 | 32 | | | | 2 | | 2 | | 1 | | ... |
| New Orleans, La. | 218 | 8 | 204 | 3 | | | 13 | 3 | | 2 | | | | ... |
| New York, N. Y. | 1,013 | 237 | 673 | 39 | | | | 5 | 5 | 17 | 6 | 2 | 11 | 5 |
| Norfolk, Va. | 235 | 73 | 78 | 69 | | | | | | 9 | 2 | 3 | | 1 |
| Ogdensburg, N. Y. | 57 | 5 | 48 | | | | | 3 | | 1 | | | | ... |
| Philadelphia, Pa. | 378 | 55 | 265 | 37 | | | | 1 | | 12 | 3 | 2 | 2 | 1 |
| Pittsburgh, Pa. | 21 | 8 | 10 | 3 | | | | | | | | | | ... |
| Port Arthur, Tex. | 126 | 50 | 57 | 13 | | | 1 | | | | | 4 | | 1 |
| Portland, Me. | 78 | 10 | 50 | 10 | | | | | | 3 | 4 | | | 1 |
| Portland, Oreg. | 354 | 6 | 339 | 2 | | | | | 1 | | | | | 5 |
| Providence, R. I. | 130 | 65 | 51 | 9 | | | | 2 | | 1 | | 1 | | 1 |
| Rochester, N. Y. | 34 | | 34 | | | | | | | | | | | ... |
| St. Louis, Mo. | 109 | 3 | 79 | 17 | | | | | | | 5 | 5 | | ... |
| St. Paul, Minn. | 5 | 1 | 4 | | | | | | | | | | | ... |
| San Francisco, Cal. | 260 | 19 | 157 | 12 | | | 2 | 5 | 4 | 18 | 10 | 21 | 11 | 1 |
| San Juan, P. R. | 28 | 5 | 11 | 2 | | | | 1 | | | | 4 | | 5 |
| Savannah, Ga. | 98 | 18 | 59 | 4 | | | | 1 | | 9 | 1 | 3 | 1 | 2 |
| Seattle, Wash. | 381 | 10 | 248 | 86 | | | 1 | 4 | 3 | 14 | 4 | 2 | 8 | 6 |
| Wilmington, N. C. | 104 | 8 | 80 | 1 | | | | 2 | | 7 | 2 | 4 | | ... |
| Total— | | | | | | | | | | | | | | |
| 1914 (41 ports) ^b | 6,720 | 768 | 4,838 | 631 | | 8 | 25 | 41 | 26 | 153 | 59 | 90 | 36 | 45 |
| 1913 (107 ports) | 3,506 | 333 | 2,783 | 23 | | 23 | 8 | 24 | 10 | 83 | 26 | 1 | 40 | 152 |
| 1912 (105 ports) | 3,634 | 165 | 3,119 | 96 | 3 | 12 | 17 | 38 | 39 | 81 | 12 | | | 52 |
| 1911 (62 ports) | 2,268 | 182 | 1,811 | 23 | 41 | 17 | 45 | 10 | 16 | 43 | 30 | | | 50 |
| 1910 (74 ports) | 1,070 | 252 | 488 | 17 | 52 | 13 | 61 | 13 | 16 | 68 | 12 | 2 | | 76 |
| 1909 (64 ports) | 1,134 | 151 | 710 | 33 | 69 | 3 | 21 | 14 | 7 | 59 | | 4 | | 63 |
| 1908 (73 ports) | 852 | 245 | 385 | 12 | 42 | 6 | 21 | 23 | 13 | 30 | 7 | 2 | | 61 |
| 1907 (66 ports) | 684 | 209 | 92 | 88 | 36 | 18 | 62 | 9 | 23 | 52 | 27 | 5 | | 63 |
| 1906 (77 ports) | 670 | 194 | 130 | 114 | 41 | 13 | 27 | 10 | 6 | 49 | 5 | 9 | | 72 |
| 1905 (63 ports) | 524 | 142 | 53 | 99 | 42 | 13 | 21 | 26 | 7 | 20 | 11 | 28 | | 62 |
| 1904 (66 ports) | 706 | 184 | 98 | 101 | 48 | 49 | 16 | 29 | 12 | 24 | 19 | (c) | | 131 |

^a Bills of health cases transferred to Treasury Department July 24, 1911.

^b Reports are now made by subports through the principal port of the district.

^c Included under "Miscellaneous" in 1904 report.

CASES REPORTED TO COLLECTORS OF CUSTOMS.

| Port. | By revenue cutters. | By Tar-ragon. | By local in-spectors. | By radio in-spectors. | By cus-toms officers. | Cases reported under allot-ments. |
|---------------------|---------------------|---------------|-----------------------|-----------------------|-----------------------|-----------------------------------|
| Baltimore, Md. | 47 | 105 | 16 | 1 | 50 | 6 |
| Boston, Mass. | 66 | 112 | 22 | 3 | 746 | 257 |
| Bridgeport, Conn. | 14 | 14 | 3 | | 103 | 80 |
| Buffalo, N. Y. | 1 | | 1 | 1 | | |
| Burlington, Vt. | | | | | 54 | 54 |
| Charleston, S. C. | 53 | 59 | 4 | | 38 | |
| Chicago, Ill. | 69 | | 12 | | 24 | 81 |
| Cleveland, Ohio. | 24 | 1 | | | 65 | 41 |
| Des Moines, Iowa. | 73 | | | | 87 | 66 |
| Detroit, Mich. | 63 | 4 | 2 | | 43 | 10 |
| Duluth, Minn. | | | 1 | | 16 | |
| Eagle Pass, Tex. | | | | | 2 | |
| Galveston, Tex. | 4 | | *3 | | 37 | 8 |
| Honolulu, Hawaii. | 9 | | | | 6 | |
| Indianapolis, Ind. | | | | | 1 | |
| Jacksonville, Fla. | 3 | 477 | 9 | | 180 | 48 |
| Juneau, Alaska. | 2 | | 1 | | 38 | |
| Laredo, Tex. | | | *3 | | 6 | 8 |
| Los Angeles, Cal. | 11 | | | | 67 | 47 |
| Louisville, Ky. | | | 1 | | 40 | 32 |
| Memphis, Tenn. | | | | | 10 | 2 |
| Milwaukee, Wis. | 9 | | 2 | 1 | 4 | |
| Mobile, Ala. | 2 | | 4 | | 151 | 113 |
| New Orleans, La. | | | *129 | | 80 | 202 |
| New York, N. Y. | 60 | 563 | 265 | 12 | 83 | |
| Norfolk, Va. | 8 | 43 | 73 | | 111 | |
| Ogdensburg, N. Y. | | 45 | | | 12 | |
| Philadelphia, Pa. | 8 | 143 | 40 | 2 | 176 | 8 |
| Pittsburgh, Pa. | | | 16 | | 5 | |
| Port Arthur, Tex. | | 16 | 6 | | 104 | |
| Portland, Me. | 38 | 2 | 6 | | 32 | |
| Portland, Oreg. | 37 | | 2 | | 315 | |
| Providence, R. I. | | 50 | 68 | | 12 | |
| Rochester, N. Y. | 2 | | | | 32 | 31 |
| St. Louis, Mo. | 5 | | 2 | | 102 | 75 |
| St. Paul, Minn. | | | | | 5 | 4 |
| San Francisco, Cal. | 168 | | 4 | 3 | 85 | 16 |
| San Juan, P. R. | 6 | | 4 | | 18 | |
| Savannah, Ga. | 12 | 17 | 1 | 1 | 67 | |
| Seattle, Wash. | 114 | | 5 | 3 | 259 | 136 |
| Wilmington, N. C. | 14 | 81 | 9 | | | |
| Total | 922 | 1,762 | 734 | 27 | 3,275 | 1,325 |

NOTE.—The foregoing statement of the work done by the various inspection services is based on reports made by collectors of customs on Cat. 1073, and is approximately correct. At Chicago, however, the allotment made by the Department was used by a revenue-cutter officer and that Service as well as the allotment has been credited with the results. At the ports marked with an asterisk (*) the local inspectors are credited with 145 cases, 137 of which were reported by a local inspector whose expenses were paid by an allotment.

The statement of cases reported under the Department allotments necessarily is approximate only.

The following table shows the number of applications for the remission or mitigation of penalties forwarded by collectors of customs during each of the past 10 years, and with certain limitations is a measure of the activity of those officers:

COMPARATIVE STATEMENT OF CASES OF VIOLATIONS OF THE NAVIGATION AND STEAMBOAT-INSPECTION LAWS REPORTED BY OFFICERS OF CUSTOMS, 1904-1914.

| Port. | 1904 | 1905 | 1906 | 1907 | 1908 | 1909 | 1910 | 1911 | 1912 | 1913 | 1914 | Total. |
|-------------------|------|------|------|------|------|------|------|------|------|------|------|--------|
| Baltimore, Md. | 65 | 30 | 14 | 34 | 21 | 43 | 49 | 114 | 129 | 294 | 219 | 1,012 |
| Boston, Mass. | 27 | 33 | 40 | 15 | 8 | 18 | 34 | 132 | 327 | 67 | 949 | 1,650 |
| Bridgeport, Conn. | 8 | 7 | 12 | 9 | 9 | 4 | 13 | 206 | 423 | 30 | 134 | 855 |
| Buffalo, N. Y. | 1 | 3 | 3 | 5 | 10 | 8 | 32 | 9 | 75 | 64 | 3 | 213 |
| Burlington, Vt. | | | | | | 2 | | | 4 | | 54 | 60 |
| Charleston, S. C. | 2 | | 5 | 21 | 3 | 2 | 4 | 1 | 4 | 13 | 154 | 209 |
| Chicago, Ill. | 8 | 7 | 8 | 7 | 21 | 5 | 70 | 138 | 55 | 35 | 105 | 459 |

COMPARATIVE STATEMENT OF CASES OF VIOLATIONS OF THE NAVIGATION AND
STEAMBOAT-INSPECTION LAWS REPORTED BY OFFICER OF CUSTOMS, 1904-1914—
Continued.

| Port. | 1904 | 1905 | 1906 | 1907 | 1908 | 1909 | 1910 | 1911 | 1912 | 1913 | 1914 | Total. |
|---------------------------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|--------|
| Cleveland, Ohio..... | 14 | 14 | 20 | 20 | 27 | 10 | 33 | 114 | 66 | 76 | 90 | 483 |
| Denver, Colo..... | | | | | | | | | | | | |
| Des Moines, Iowa..... | 1 | | 2 | 3 | 5 | 4 | | | 3 | | 180 | 178 |
| Detroit, Mich..... | 33 | 23 | 41 | 48 | 28 | 86 | 161 | 69 | 251 | 221 | 112 | 1,073 |
| Duluth, Minn..... | 34 | 16 | 15 | 16 | 15 | 14 | 46 | 9 | 13 | 15 | 17 | 210 |
| Eagle Pass, Tex..... | | | | | | | | 1 | 8 | 28 | 2 | 34 |
| El Paso, Tex..... | | | | | | | | | | | | |
| Galveston, Tex..... | 7 | 8 | 8 | 15 | 5 | 9 | 1 | 6 | 2 | 39 | 49 | 146 |
| Great Falls, Mont..... | | | 1 | | | | | | | | | 1 |
| Honolulu, Hawaii..... | 6 | 2 | 8 | | 7 | 17 | 20 | 14 | 14 | 11 | 15 | 114 |
| Indianapolis, Ind..... | | | | | 2 | | | 7 | 23 | 5 | 1 | 38 |
| Jacksonville, Fla..... | 27 | 33 | 46 | 54 | 20 | 27 | 80 | 135 | 683 | 364 | 666 | 2,146 |
| Juneau, Alaska..... | 18 | 21 | 10 | 22 | 9 | 8 | 17 | 113 | 67 | 27 | 41 | 353 |
| Laredo, Tex..... | 1 | | | | | | | 1 | 16 | 5 | 14 | 37 |
| Los Angeles, Cal..... | | 8 | 5 | 5 | 52 | 4 | 26 | 65 | 36 | 23 | 79 | 308 |
| Louisville, Ky..... | | 1 | 2 | 5 | | | 1 | 14 | 24 | 6 | 41 | 94 |
| Memphis, Tenn..... | 3 | 3 | 7 | 4 | 4 | 3 | 3 | 10 | 12 | 9 | 10 | 68 |
| Milwaukee, Wis..... | 2 | 6 | 9 | 4 | 14 | 19 | 13 | 16 | 22 | 16 | 16 | 137 |
| Mobile, Ala..... | 21 | 35 | 32 | 23 | 6 | 9 | 41 | 36 | 40 | 30 | 157 | 430 |
| New Orleans, La..... | 11 | 15 | 38 | 21 | 21 | 16 | 24 | 51 | 71 | 73 | 218 | 559 |
| Newport, Vt..... | | | | | | | | | | 1 | | 1 |
| New York, N. Y..... | 104 | 182 | 160 | 124 | 250 | 638 | 174 | 292 | 352 | 330 | 1,013 | 3,629 |
| Nogales, Ariz..... | | | | | | | | | | | | |
| Norfolk, Va..... | 43 | 12 | 21 | 16 | 170 | 66 | 43 | 214 | 121 | 499 | 235 | 1,431 |
| Ogdensburg, N. Y..... | 5 | 4 | 2 | 4 | 4 | 6 | 6 | 13 | 25 | 20 | 57 | 146 |
| Omaha, Neb..... | | | | | | | | | | | | |
| Pembina, N. Dak..... | | | | | | | | | | 8 | | 8 |
| Philadelphia, Pa..... | 25 | 12 | 26 | 16 | 10 | 8 | 17 | 25 | 28 | 164 | 378 | 709 |
| Pittsburgh, Pa..... | | | | | 3 | 5 | | 1 | 24 | 6 | 21 | 60 |
| Port Arthur, Tex..... | | | | 6 | 4 | 3 | 5 | 28 | 35 | 10 | 126 | 217 |
| Portland, Me..... | 7 | 9 | 5 | 7 | 14 | 13 | 26 | 86 | 157 | 51 | 78 | 453 |
| Portland, Oreg..... | 7 | 9 | 11 | 5 | 2 | 3 | 6 | 7 | 125 | 331 | 254 | 858 |
| Providence, R. I..... | 1 | 2 | 14 | 9 | 9 | 13 | 7 | 79 | 70 | 20 | 130 | 354 |
| Rochester, N. Y..... | | | 4 | 1 | 2 | 1 | 7 | 18 | 23 | 42 | 34 | 122 |
| St. Louis, Mo..... | | | 1 | | 3 | 3 | 8 | 30 | 88 | 20 | 109 | 262 |
| St. Paul, Minn..... | 1 | 1 | 1 | | | 2 | | 8 | | | 5 | 13 |
| Salt Lake City, Utah..... | | | | | | | | | | | | |
| San Francisco, Cal..... | 6 | 20 | 11 | 73 | 25 | 20 | 70 | 108 | 64 | 107 | 260 | 759 |
| San Juan, P. R..... | 11 | 4 | 4 | 3 | 13 | 3 | 9 | 9 | 25 | 18 | 28 | 127 |
| Savannah, Ga..... | 5 | 1 | 7 | 1 | 6 | 2 | 1 | 2 | 7 | 6 | 98 | 136 |
| Seattle, Wash..... | 138 | 54 | 72 | 87 | 33 | 29 | 19 | 74 | 108 | 59 | 381 | 1,064 |
| Wilmington, N. C..... | 4 | 3 | 5 | 1 | 8 | 11 | 5 | 23 | 20 | 373 | 104 | 557 |
| Total (49 ports)..... | 706 | 524 | 670 | 684 | 852 | 1,134 | 1,070 | 2,268 | 3,634 | 3,506 | 6,720 | 21,768 |

MOTOR BOAT "TARRAGON."

The *Tarragon* during the fiscal years 1913 and 1914 has demonstrated that it is the most effective means for the enforcement of the navigation laws. During the fiscal year 1914 this vessel reported to collectors of customs 1,762 violations of the navigation laws, as compared with 922 reported by the Revenue-Cutter Service, 734 by the local inspectors of steam vessels, 27 by the radio inspectors, 1,325 by collectors of customs under allotments made by this Department for the hire of motor boats, and 1,950 cases discovered by customs officers without the aid of such allotment. Of this latter number, however, the great majority consisted of failures to surrender the licenses of vessels, and violations of a nature discovered in the regular routine business of the customhouse, without the necessity for inspection.

During the year the *Tarragon* made more or less systematic inspections in every customs district from Key West, Fla., to Eastport, Me. She traveled a distance of approximately 6,076 miles in all kinds of weather and under all conditions. It was found that approximately one vessel out of every three inspected was without proper equipment. It is estimated that the vessel during this time made over 6,000 inspections.

On the waters covered by the *Tarragon* it is estimated by collectors of customs that there are at present 130,086 small undocumented motor boats. It was possible for the *Tarragon* to inspect only about 5 per cent of these vessels on the waters covered by her. The effect of the inspections, however, has been to secure a wider compliance with the law than has been the case since the number of motor boats reached its present proportions.

The following table shows the total expenditures in connection with this vessel since the date of her purchase, June 24, 1912, to the end of the fiscal year June 30, 1914:

EXPENDITURES FOR THE MOTOR BOAT "TARRAGON."

| | 1912 | 1913 | 1914 | Total |
|---|-----------------|-----------------|------------------|------------------|
| Plant: | | | | |
| First cost..... | \$4,500.00 | | | \$4,500.00 |
| New construction..... | | \$1,553.68 | \$1,717.65 | 3,271.33 |
| Instruments and other equipment..... | 368.90 | 355.24 | 32.00 | 756.14 |
| Furniture..... | 77.55 | 226.63 | 84.92 | 389.10 |
| Repairs..... | 297.94 | 1,506.92 | 2,061.26 | 3,866.12 |
| Total..... | 5,244.39 | 3,642.47 | 3,925.83 | 12,812.69 |
| Personnel: | | | | |
| Salaries..... | 25.67 | 2,992.85 | 4,130.00 | 7,148.52 |
| Provisions and household supplies..... | 133.96 | 591.22 | 818.87 | 1,544.05 |
| Cleaning, etc..... | | 11.78 | 7.68 | 19.41 |
| Laundry..... | | 93.32 | 67.64 | 160.96 |
| Shore transportation, subsistence and expenses..... | 84.87 | 222.63 | 859.93 | 1,167.47 |
| Telegrams and telephones..... | 1.41 | 24.30 | 31.79 | 57.50 |
| Fuel, galley, and heat..... | | 42.67 | 43.86 | 86.53 |
| Total..... | 245.91 | 3,978.77 | 5,969.76 | 10,184.44 |
| Navigation: | | | | |
| Gasoline..... | 250.10 | 1,046.93 | 834.29 | 2,131.32 |
| Lubricating oil, engine, and electric supplies..... | 76.23 | 301.60 | 269.88 | 677.70 |
| Pilotage and canal tolls..... | | 53.00 | 316.00 | 369.00 |
| Total..... | 326.33 | 1,401.53 | 1,450.17 | 3,178.02 |
| Grand total..... | 5,816.62 | 9,022.77 | 11,335.76 | 26,175.15 |

The vessel was purchased originally for use on Chesapeake Bay and tributaries, and her construction and general arrangement of quarters were well fitted for that work. The excellent results obtained, however, by the vessel convinced the Department that the radius of her operations could be extended, and during the year, accordingly, her hull was strengthened, and extraordinary repairs were made at a total cost of \$3,305.60. During her operation it was found advisable for the navigation officer in charge of the vessel to make side trips to places expensive for the *Tarragon* to reach, and \$535.72 was expended in this way. Deducting these extraordinary expenses from the total cost in connection with the vessel for the year, leaves \$7,494.44 as her actual navigating expenses, including salaries and expenses of every kind.

One of the principal duties of this vessel is the supervision of the oyster fleets on the Chesapeake and Delaware Bays and the sounds of North Carolina. Reports of illegal shipments, cruel treatment of the crew, insufficient food, and inadequate quarters published by the press and submitted by charitable institutions were investigated with the results mentioned in my report for 1912.

On Chesapeake Bay there are 1,200 of these vessels, with crews aggregating 3,500 men. There are perhaps as many more on Delaware Bay and River and the sounds of North Carolina. It is the purpose of the Department again during the coming winter to make a thorough inspection of these fleets, in order that the good results already secured may not be lessened, and to extend the inspection to waters which heretofore have not been covered.

MOTOR BOATS.

The following recommendations in this report for last year, on the subject of motor-boat regulation, are renewed:

It does not seem feasible or necessary to apply in their entirety the laws and regulations governing steam vessels (of which there are about 8,000 subject to the inspection laws), to thirty times that number of motor boats. The cost of administration would be very large and the need does not, to my mind, justify the expenditure. At the same time it does not seem right that there should be no restriction whatever upon the number of passengers that can be carried upon the motor boat beyond the requirement that there must be a life preserver for each person carried. That requirement in itself is a reasonable regulation in the case of small boats. When, however, as is frequently the case, 25, 50, or as many as 100 persons are crowded on these small boats, serious risks are incurred, which it is the part of prudence to diminish by legislation.

The passage of a law is suggested providing that motor boats shall not carry passengers in excess of an arbitrary fixed number, unless they have been subject to the inspection prescribed for the like type of steam vessels and unless those in charge of them have been licensed after examination in the same manner as the corresponding officers on steam vessels are licensed. Such legislation should not take tonnage as its basis but should be based on the length of the vessel over all, which is much more readily ascertained. Legislation along these lines should consider also the nature of the waters on which the boat is employed. After consultation with those competent to express correct and disinterested opinions on the subject, it is hoped to submit a draft of a bill for your consideration.

The advantages of a Federal system of numbering motor boats were presented at some length in last year's report by the officers more directly concerned with the administration of the motor-boat law. The States have found it necessary to establish systems of numbering automobiles, and for some reasons a Federal system of numbering motor boats may be necessary. The following measure seems as simple as can be devised, if Congress shall deem it necessary to take up the subject:

"A BILL To require numbering and recording of undocumented vessels.

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That every undocumented vessel, operated in whole or in part by machinery, owned in the United States and found on the navigable waters thereof, except public vessels, shall be numbered and a record thereof kept in the customhouse of the district in which the owner or managing owner resides..

"SEC. 2. That the said numbers, on application of the owner or master, shall be awarded by the collector of customs of the district in which the vessel is owned, and shall be not less in size than three inches and painted or attached to each bow of the vessel in such manner and color as to be distinctly visible and legible.

"SEC. 3. That notice of destruction or abandonment of such vessels or change of their ownership shall be furnished within ten days by the owners to the collectors of customs of the districts where such numbers were awarded. Such vessels sold into another customs district may be numbered anew in the latter district.

"SEC. 4. That the penalty for violation of any provision of this act shall be ten dollars, for which the vessel shall be liable and may be seized and proceeded against in the district court of the United States in any district in which such vessel may be found.

"SEC. 5. That the Secretary of Commerce shall make such regulation as may be necessary to secure proper execution of this Act by collectors of customs and other officers of the Government.

"This Act shall take effect six months after its passage."

RADIO COMMUNICATION.

The act requiring apparatus and operators for radio communication on ocean steamers was passed June 24, 1910, and took effect July 1, 1911. Its scope was greatly extended by the act of July 23, 1912, and this was followed by the ratification by the Senate of the Berlin Radiotelegraphic Convention, of the London Radiotelegraphic Convention, and by the act of August 13, 1912, to regulate radio communication. The radio service of the Bureau of Navigation, begun three years ago, has now been organized in a manner which it is believed will admit of economical and orderly performance of the work prescribed by Congress. This work consists of the inspection of the apparatus and operators on ship stations, American and foreign, and at coast stations, commercial, experimental, and amateur; of the license of American stations, ship and shore, and of the several classes of operators; and, finally, of general assistance and cooperation in securing improvements in apparatus and raising the standard of operators. The field force during the past fiscal year comprised 12 inspectors. The following table shows the number of inspections of stations and the number of operators examined as to qualifications by the radio-inspection force for 1914, with brief comparative figures for 1913:

INSPECTIONS AND EXAMINATIONS.

(District headquarters shown in small capitals.)

| Ports visited. | Stations inspected. | | | | Operators examined. | | |
|-------------------------|---------------------|-------------------|----------------------------|--------|---------------------|----------------------|--------|
| | Ship. | Commercial, land. | Amateur and special, land. | Total. | Commercial. | Amateur and special. | Total. |
| First district: | | | | | | | |
| Boston, Mass. | 866 | 7 | 73 | 946 | | 70 | 70 |
| Cape Cod, Mass. | | 1 | | 1 | | | |
| New Bedford, Mass. | | | 4 | 4 | | 3 | 3 |
| Newport, R. I. | | 1 | 11 | 12 | | | |
| Portland, Me. | 43 | | 5 | 48 | | | |
| Siasconset, Mass. | | 2 | | 2 | | | |
| South Wellfleet, Mass. | 1 | 4 | | 5 | | | |
| Woods Hole, Mass. | | | 2 | 2 | | | |
| Total.....1914.. | 910 | 15 | 95 | 1,020 | | 73 | 73 |
|1913.. | 179 | 10 | 123 | 312 | 9 | 24 | 33 |
| Second district: | | | | | | | |
| New York, N. Y. | 2,022 | 12 | 18 | 2,052 | | 6 | 6 |
| Binghamton, N. Y. | | 1 | | 1 | | | |
| Sagaponack, N. Y. | | | | | 1 | | 1 |
| Scranton, Pa. | | 1 | | 1 | | | |
| Tuckerton, N. J. | | 1 | | 1 | | | |
| Total.....1914.. | 2,022 | 15 | 18 | 2,055 | 1 | 6 | 7 |
|1913.. | 804 | 19 | 12 | 835 | | | |
| Third district: | | | | | | | |
| Baltimore, Md. | 375 | 2 | 19 | 396 | 63 | 250 | 313 |
| Atlantic City, N. J. | | | 3 | 3 | | | |
| Cape May, N. J. | | 2 | 3 | 5 | | | |
| Jenkintown, Pa. | | | 2 | 2 | | | |
| Norfolk, Va. | 125 | | | 125 | 1 | 10 | 11 |
| Philadelphia, Pa. | 228 | 9 | 13 | 250 | 1 | 6 | 7 |
| Rockville, Md. | | | 1 | 1 | | | |
| Virginia Beach, Va. | | 1 | | 1 | | | |
| Washington, D. C. | 3 | | | 3 | | | |
| Wildwood, N. J. | | | 2 | 2 | | | |
| Total.....1914.. | 731 | 14 | 43 | 788 | 65 | 266 | 331 |
|1913.. | 417 | 18 | 40 | 475 | 185 | 37 | 222 |

INSPECTIONS AND EXAMINATIONS—Continued.

| Ports visited. | Stations inspected. | | | | Operators examined. | | |
|-------------------------------|---------------------|------------------------|-------------------------------------|--------------|---------------------|----------------------------|--------------|
| | Ship. | Commer- cial, land. | Amateur and special, land. | Total. | Commer- cial. | Amateur and special. | Total. |
| Fourth district: | | | | | | | |
| SAVANNAH, GA. | 216 | 7 | 8 | 231 | 9 | 13 | 22 |
| Brunswick, Ga. | 1 | | | 1 | | | |
| Cape Hatteras, N. C. | | 3 | | 2 | | | |
| Charleston, S. C. | 1 | 1 | | 2 | 1 | | 1 |
| Jacksonville, Fla. | 11 | 8 | 12 | 26 | 3 | | 3 |
| Key West, Fla. | 4 | | | 4 | | | |
| Miami, Fla. | | 1 | | 1 | | | |
| Tampa, Fla. | 2 | 2 | | 4 | 2 | | 2 |
| Total.....1914.. | 235 | 16 | 20 | 271 | 15 | 13 | 28 |
| 1913.. | 123 | 9 | 9 | 141 | 12 | 8 | 20 |
| Fifth district: | | | | | | | |
| NEW ORLEANS, LA. | 645 | 18 | 38 | 701 | 17 | 10 | 27 |
| Algiers, La. | 1 | | | 1 | | | |
| Beaumont, Tex. | | | 2 | 2 | | | |
| Burrwood, La. | 1 | 1 | | 2 | | | |
| Fort Morgan, Ala. | | 1 | | 1 | | | |
| Galveston, Tex. | 99 | 3 | | 72 | 3 | 2 | 5 |
| Grand Isle, La. | | 3 | | 3 | | | |
| Mobile, Ala. | | 1 | 2 | 3 | 1 | | 1 |
| Montgomery, Ala. | | | 3 | 3 | | | |
| Fort Arthur, Tex. | 5 | 3 | 8 | 8 | 1 | | 1 |
| Texas City, Tex. | 3 | | | 3 | | | |
| Total.....1914.. | 724 | 30 | 45 | 799 | 22 | 12 | 34 |
| 1913.. | 399 | 24 | 60 | 483 | 33 | 5 | 38 |
| Sixth district: | | | | | | | |
| SAN FRANCISCO, CAL. | 959 | 4 | 7 | 970 | 927 | 98 | 1,025 |
| Avalon, Cal. | | 1 | | 1 | | | |
| East San Pedro, Cal. | | 1 | | 1 | | | |
| Los Angeles, Cal. | 1 | 3 | 3 | 7 | 8 | 5 | 13 |
| San Diego, Cal. | | 1 | 1 | 2 | | | |
| San Luis Obispo, Cal. | | 1 | | 1 | | | |
| Total.....1914.. | 960 | 11 | 11 | 982 | 935 | 103 | 1,038 |
| 1913.. | 1,091 | 26 | 90 | 1,207 | 587 | 78 | 665 |
| Seventh district: | | | | | | | |
| SEATTLE, WASH. | 702 | 2 | | 704 | 36 | 63 | 99 |
| Total.....1914.. | 702 | 2 | | 704 | 36 | 63 | 99 |
| 1913.. | 116 | 9 | 5 | 130 | 19 | 7 | 26 |
| Eighth district: | | | | | | | |
| CLEVELAND, OHIO. | 96 | 2 | 2 | 100 | 149 | 338 | 487 |
| Ashtabula, Ohio. | 2 | 1 | | 3 | | | |
| Buffalo, N. Y. | 4 | 2 | | 6 | 2 | | 2 |
| Conneaut, Ohio. | 4 | | | 4 | | | |
| Detroit, Mich. | 21 | 7 | | 28 | 5 | | 5 |
| Frankfort, Mich. | 5 | 2 | | 7 | 2 | | 2 |
| Grand Haven, Mich. | | 2 | | 2 | | | |
| Ludington, Mich. | 7 | 2 | | 9 | 3 | | 3 |
| Total.....1914.. | 139 | 18 | 2 | 159 | 161 | 338 | 499 |
| 1913.. | 47 | 13 | 150 | 210 | 149 | 107 | 256 |
| Ninth district: | | | | | | | |
| CHICAGO, ILL. | 60 | 1 | 5 | 66 | 59 | 65 | 124 |
| Calumet, Mich. | | 1 | | 1 | 1 | | 1 |
| Duluth, Minn. | 2 | | | 3 | 2 | | 2 |
| Grand Marais, Mich. | | 1 | | 1 | 1 | | 1 |
| Mackinac Island, Mich. | | 1 | | 1 | | | |
| Manistique, Mich. | | 1 | | 1 | | | |
| Milwaukee, Wis. | 1 | 1 | | 2 | 1 | | 1 |
| Valparaiso, Ind. | | 1 | | 1 | 7 | | 7 |
| Total.....1914.. | 63 | 8 | 5 | 76 | 71 | 65 | 136 |
| 1913.. | 25 | 11 | 87 | 123 | 111 | 56 | 167 |
| Grand total.....1914.. | 6,486 | 129 | 239 | 6,854 | 1,306 | 939 | 2,245 |
| 1913.. | 3,201 | 139 | 576 | 3,916 | 1,105 | 322 | 1,427 |

The main object of the legislation was to promote safety of navigation at sea and on the Great Lakes, and, as the table indicates, the main efforts of the force have been turned toward ship inspections. Beside the work covered in the table, the inspectors have examined applications for the license of stations in accord with the international convention and with the act of Congress, and in the case of all ship stations and all shore stations of any considerable range have examined in detail and tested the apparatus. Based on this work the Department has issued 2,309 licenses for radio stations, a summary of which is printed in Appendix K. Examinations were held by the Bureau's inspectors of 2,245 applicants for licenses as radio operators, of whom 1,547 were found competent and licensed by the Department, as shown by the following table:

RADIO OPERATORS' LICENSES ISSUED BY RADIO INSPECTORS, FISCAL YEAR 1914.

| Districts. | Grades. | | | | | | Total. |
|---------------------------|-------------|---------|-----------------------------|--------|----------|---------|--------|
| | Commercial. | | Experiment and instruction. | Cargo. | Amateur. | | |
| | First. | Second. | | | First. | Second. | |
| First..... | ..... | ..... | ..... | 1 | 21 | 54 | 76 |
| Second..... | 1 | ..... | 4 | ..... | ..... | 50 | 64 |
| Third..... | 27 | 3 | ..... | 6 | 62 | 187 | 285 |
| Fourth..... | 9 | 1 | 2 | 2 | 2 | 11 | 27 |
| Fifth..... | 6 | 5 | ..... | 3 | 8 | 20 | 51 |
| Sixth..... | 135 | 9 | ..... | 13 | 38 | 279 | 474 |
| Seventh..... | 10 | 1 | ..... | 1 | 7 | 43 | 62 |
| Eighth..... | 52 | 40 | 1 | ..... | 47 | 214 | 354 |
| Ninth..... | 21 | 19 | 3 | ..... | 27 | 84 | 164 |
| Total, 1914..... | 261 | 78 | 10 | 28 | 212 | 960 | 1,547 |
| Total issued to date..... | 2,513 | 393 | 20 | 129 | 1,319 | 1,737 | 6,114 |

Additional licenses issued as follows:

By Bureau of Navigation—Commercial, extra first, 1.

By Bureau of Standards—Commercial, 2; experiment and instruction, 1; amateur first, 2.

By Army and Navy—Commercial, 620; experiment and instruction, 1; cargo, 102; amateur first, 414; amateur second, 11.

About one out of every three failed to pass the examinations during the past year because the standard requirements have been raised. The corps of radio operators on shipboard within the past few years has demonstrated many times its high sense of duty, and it is the aim of the inspection service in every practical way to encourage its esprit de corps. The Bureau's inspectors in nearly every instance have themselves been operators, and are thus in a position to appreciate the conditions under which operators must do their work and to assist them in practical ways. The inspectors are also men of recognized technical attainments, and their time in part is devoted to suggesting improvements in apparatus. An instance of the value of this work is shown in the case of the small steamship *Atlantis* which went ashore about 100 miles north of Tampico in May. The radio inspector for the New Orleans district had a short time before secured improvements in the apparatus on the ship by which, at the time of the disaster, it was possible to send out calls to Navy vessels more than 100 miles distant, and 98 refugees from Mexico, including women and children, were saved.

Marine disasters continue to show the need for auxiliary wireless apparatus on shipboard, and especial attention has been given to the improvement of this apparatus. At a meeting held April 2, 1914, at the office of the Commissioner of Navigation, chairman of the committee representing the various departments of the Government concerned, of representatives of those departments and representatives of the American and British Marconi Wireless Telegraph Companies, the following propositions were unanimously agreed to:

1. That the days of the induction coil are numbered, and its use shall not be extended beyond those manufactured or now being manufactured.

2. That the plain aerial shall be abandoned and the induction coil shall be connected with the antenna through an oscillation transformer, subject to test by radio inspector in each case.

3. That a motor generator or rotary converter operated by storage battery is probably the most satisfactory means available at present of energizing the transmitting apparatus.

4. That because of the well-known reliability of the magnetic detector, its continued use be approved provided tests made with the above specified transmitting arrangements shall show that it will give clearly perceptible signals at the range required for emergency use under normal daylight conditions.

As a result of this agreement, out-of-date apparatus is now being superseded on shipboard by more efficient auxiliaries.

The art of radio communication is rapidly advancing along scientific and engineering lines. The use of apparatus for radio communication is rapidly extending on land as well as at sea. The radio telephone is now developed to such a stage that it must be given proper consideration. The high-powered stations for transoceanic service which have recently been completed or are under construction in the United States employ new inventions along the line of apparatus and long-wave lengths.

The high-powered stations comprise those of the Federal Telegraph Co., which employ the Poulsen arc system; the Marconi stations at Chatham, Belmar, and Marshalls, which employ high-speed automatic sending and receiving; the Goldschmidt station at Tuckerton, which employs a system entirely out of the ordinary.

New instruments and equipment are necessary to make measurements and tests which are beyond the range and scope of the present equipment.

Increased field force and travel allowances are necessary to meet the growing demands. More attention must be given to amateur stations on land, of which there are about 20,000. Some attention must be given to receiving stations which at present come under the law only as regards secrecy of messages. It has been possible under the present appropriation to attend to very few amateur stations; only about 5,000 have been licensed and less than 1,000 have been inspected.

It is desirable that the offices of the radio inspectors at Boston, New York, New Orleans, San Francisco, and Seattle be equipped with special apparatus which will permit the inspector to make certain measurements required by law, such as range, wave length and decrement, without going on board vessels. These equipments will also provide inspectors with a means of procuring first-hand evidence of violations of the interference and wave-length laws. These stations

will also prove to be excellent control centers in cases of emergency. Assistant inspectors at these stations should be expert operators.

The following statement shows in detail the expenditures for this service during the fiscal years 1913 and 1914, the proposed distribution for the current fiscal year, and the estimates for 1916:

EXPENDITURES DURING FISCAL YEAR 1913 AND 1914, PROPOSED DISTRIBUTION DURING CURRENT FISCAL YEAR, AND ESTIMATES FOR 1916.

| | 1913 | 1914 | 1915 | 1916 | Increase over 1915. |
|--------------------------|------------------|------------------|------------------|------------------|------------------------|
| Total salaries: | | | | | |
| Field..... | \$15,673.58 | \$24,092.50 | \$29,540.00 | \$30,440.00 | \$900.00 |
| Bureau..... | 4,328.22 | 5,763.75 | 7,150.00 | 8,350.00 | 1,200.00 |
| Total..... | 20,001.80 | 29,856.25 | 36,690.00 | 38,790.00 | 2,100.00 |
| General expenses: | | | | | |
| Travel..... | 4,150.93 | 6,044.10 | 5,000.00 | 5,000.00 | ..... |
| Telephone..... | 126.84 | 364.71 | 400.00 | 400.00 | ..... |
| Laundry..... | 22.22 | 127.04 | ..... | ..... | ..... |
| Furniture..... | 208.21 | ..... | 400.00 | 400.00 | ..... |
| Supplies..... | 923.51 | 636.91 | 450.00 | 450.00 | ..... |
| Printing..... | 2,124.12 | 20.81 | ..... | ..... | ..... |
| New instruments..... | 9,972.40 | 171.11 | 100.00 | 1,500.00 | 1,400.00 |
| Repairs..... | 20.80 | 46.93 | 1,600.00 | 500.00 | ..... |
| Telegrams..... | 74.23 | 34.87 | 50.00 | 75.00 | 25.00 |
| Freight..... | 210.49 | 234.59 | 200.00 | 300.00 | 100.00 |
| Unexpended..... | 44.45 | 342.68 | 110.00 | ..... | ..... |
| Grand total..... | 37,880.00 | 37,880.00 | 45,000.00 | 47,525.00 | 2,525.00 |
| Decrease in repairs..... | ..... | ..... | ..... | ..... | 1,100.00 |
| | | | | | 2,525.00 |

The act of 1910, as amended by the act of 1912, requiring apparatus and operators for radio communication, in the main has worked satisfactorily. Several minor amendments to the act of August 13, 1912, to regulate radio communication, are desirable to bring that act into accord with the London Radiotelegraphic Convention. It is more important, however, that some regulation of the rentals charged for radio apparatus on shipboard should be established by Congress. The reasons for this recommendation were set forth at length at pages 38 to 40 of this report for 1912, and they are confirmed by the present situation.

WORK OF SHIPPING COMMISSIONERS.

Summaries of the work of shipping commissioners for the past fiscal year, so far as they can be expressed in statistical terms, are printed in Appendix A. The opening of the Panama Canal to traffic will considerably increase the amount of work of shipping commissioners, and the ship-registry act of August 18, 1914, will add very greatly to their duties. Barely a month, however, has elapsed since these two causes of increased activity in shipping commissioners' offices have been at work, and it is not practicable to determine precisely the additional force which will be required. The estimates call for an increase of only \$1,800 (additional clerks at New York and New Orleans) because in view of the large reductions in revenue consequent upon the European war the utmost economy has been enjoined. For the same reason small increases in salaries for deserving clerks in several instances have not been recommended. Under more favorable conditions another year it is hoped that appropriations may be secured proportionate to the increase in the amount and

difficulty of the work of the shipping commissioners and their clerks. The following summary shows the aggregate routine work and salaries of shipping commissioners and deputies for the past decade:

| Year. | Seamen shipped, reshipped, and discharged. | Salaries. | Average cost per man. | Year. | Seamen shipped, reshipped, and discharged. | Salaries. | Average cost per man. |
|-----------|--|-------------|-----------------------|-----------|--|-------------|-----------------------|
| 1905..... | 218,031 | \$59,282.67 | \$0.27 | 1910..... | 356,448 | \$65,539.19 | \$0.18 |
| 1906..... | 227,392 | 60,595.23 | .26 | 1911..... | 367,023 | 67,155.90 | .18 |
| 1907..... | 259,570 | 61,716.60 | .24 | 1912..... | 374,783 | 63,373.53 | .17 |
| 1908..... | 307,299 | 63,585.16 | .21 | 1913..... | 379,188 | 62,374.13 | .16 |
| 1909..... | 341,980 | 62,944.79 | .18 | 1914..... | 378,772 | 63,475.20 | .17 |

NATIONALITY OF CREWS.

The men shipped and reshipped (including repeated voyages) by shipping commissioners on vessels of the United States during the past seven fiscal years were classed by nationality as follows:

| Nationality. | 1906 | 1909 | 1910 | 1911 | 1912 | 1913 | 1914 |
|------------------------------|---------|---------|---------|---------|---------|---------|---------|
| Americans (born)..... | 52,065 | 58,692 | 59,810 | 59,902 | 58,109 | 63,040 | 63,247 |
| Americans (naturalized)..... | 28,713 | 31,073 | 31,736 | 31,810 | 35,562 | 32,780 | 31,417 |
| British..... | 19,964 | 21,572 | 21,047 | 23,674 | 21,083 | 24,031 | 24,745 |
| Chinese..... | 369 | 127 | 137 | 68 | 55 | 65 | 64 |
| Japanese..... | 585 | 686 | 480 | 380 | 290 | 193 | 96 |
| Filipinos..... | 120 | 135 | 126 | 126 | 184 | 258 | 473 |
| Germans..... | 6,158 | 6,153 | 6,832 | 7,673 | 7,185 | 9,185 | 9,497 |
| Norwegians..... | 8,182 | 9,031 | 9,190 | 9,889 | 9,394 | 8,679 | 8,194 |
| Swedes..... | 6,008 | 6,571 | 7,123 | 6,615 | 7,565 | 6,995 | 6,321 |
| Danes..... | 2,316 | 2,238 | 2,293 | 2,590 | 2,744 | 2,510 | 2,260 |
| Russians..... | 3,714 | 3,750 | 3,684 | 3,956 | 4,403 | 4,483 | 4,326 |
| Austrians..... | 1,430 | 1,527 | 1,513 | 1,838 | 2,240 | 2,980 | 3,363 |
| French..... | 630 | 762 | 517 | 610 | 614 | 615 | 617 |
| Spanish..... | 17,894 | 23,306 | 24,546 | 26,059 | 26,247 | 20,511 | 25,022 |
| Italians..... | 3,462 | 3,540 | 3,649 | 4,021 | 3,877 | 4,813 | 4,368 |
| Portuguese..... | 3,850 | 3,901 | 4,073 | 4,197 | 3,924 | 4,384 | 3,921 |
| Others..... | 7,603 | 7,858 | 8,952 | 8,766 | 11,762 | 12,434 | 11,442 |
| Unknown..... | 129 | 20 | 13 | 117 | 3,037 | 66 | 10 |
| Total..... | 163,192 | 180,942 | 185,721 | 192,191 | 198,225 | 198,024 | 199,584 |
| Per cent Americans..... | 49.5 | 49.6 | 49.3 | 47.7 | 47.3 | 48.4 | 47.4 |

These figures do not include, of course, seamen shipped abroad before consuls on American vessels.

DESERTION OF SEAMEN.

The percentage of seamen who desert from American vessels is relatively small, and desertion has ceased to be so considerable a factor in American shipping as it was in the days of sailing vessels. The percentage of seamen who fail to report on board after having signed articles before shipping commissioners in ports of the United States for the past 10 years is shown by the following table:

| Year. | Shipped and re-shipped. | Failed to join. | Per cent. | Year. | Shipped and re-shipped. | Failed to join. | Per cent. |
|-----------|-------------------------|-----------------|-----------|-----------|-------------------------|-----------------|-----------|
| 1905..... | 120,782 | 3,273 | 2.71 | 1910..... | 185,721 | 2,690 | 1.45 |
| 1906..... | 126,745 | 3,894 | 3.07 | 1911..... | 192,191 | 3,052 | 1.60 |
| 1907..... | 143,999 | 4,007 | 2.79 | 1912..... | 198,225 | 3,849 | 1.94 |
| 1908..... | 163,192 | 3,101 | 1.90 | 1913..... | 198,024 | 3,906 | 1.97 |
| 1909..... | 181,032 | 2,114 | 1.17 | 1914..... | 199,584 | 2,771 | 1.39 |

The law providing for the arrest for desertion of seamen from American vessels in Europe, Asia, Africa, Australia, and South America is an empty form on the statute books, as the power bestowed is almost never invoked. The repeal of the fragment of law left on the subject has been recommended for several years, and that recommendation is renewed.

ALLOTMENT NOTES.

The following table shows the number of allotment notes issued in recent years under section 24 of the act of December 21, 1898, to seamen on vessels of the United States:

| Year. | Creditors. | | Relatives. | Total. |
|-----------|----------------|--------------------|------------|--------|
| | Square-rigged. | All other vessels. | | |
| 1903..... | 2,005 | 1,870 | 284 | 4,159 |
| 1904..... | 1,966 | 1,513 | 287 | 3,766 |
| 1905..... | 1,595 | 919 | 304 | 2,818 |
| 1906..... | 1,492 | 421 | 309 | 2,222 |
| 1907..... | 1,323 | 490 | 239 | 2,052 |
| 1908..... | 967 | 393 | 133 | 1,493 |
| 1909..... | 660 | 114 | 84 | 858 |
| 1910..... | 681 | 145 | 79 | 905 |
| 1911..... | 505 | 241 | 57 | 803 |
| 1912..... | 555 | 296 | 62 | 913 |
| 1913..... | 419 | 185 | 64 | 668 |
| 1914..... | 267 | 279 | 166 | 702 |

NAVIGATION RECEIPTS.

The receipts from tonnage duties last year were \$1,310,759.03, compared with \$1,273,789.43 the previous year. The receipts for the current fiscal year from this source will be materially reduced by the cessation of foreign trade, beginning in August, with German and Austro-Hungarian ports, and by diminished trade with other foreign ports in consequence of the war. The receipts will also be somewhat reduced by modifications in the system of measurement mentioned on another page. The receipts from navigation fees during the year amounted to \$152,694.19. These fees are collected in small amounts, seldom equaling as much as \$5 in the case of any one ship. They involve considerable clerical work, which means a high cost of collection. Whenever the revenues of the Government will permit, these fees well might be abolished.

The collections from navigation fines amounted to \$40,741.38, making the total receipts from the three sources named \$1,504,194.60.

The Supreme Court of the United States on February 24, 1914, affirmed the constitutionality of section 37 of the tariff act of 1909 imposing an excise on foreign-built yachts owned by Americans. Under this decision the sum of \$412,346.31, details of which are printed in Appendix J, was collected during the year. This amount is an extraordinary receipt, and covers collections of revenues due since 1909 but held in abeyance pending the determination of the constitutionality of the section. The section was repealed by the tariff act of October 3, 1913.

COUNTING OF PASSENGERS.

On July 29, 1914, Congress provided the sum of \$15,000 for the employment by this Department of inspectors to count passengers on steamers. Although the season was well advanced before this money was available the Department was able to begin the work. At 27 ports 1,415,669 passengers were counted during the month of August. The scope of this service was considerably extended, as inspectors before and after counting passengers made thorough examinations of the vessels involved to ascertain that the equipment required by law was on board, and that the vessel was provided with the necessary number of licensed officers. This service has enabled the Department to secure a more thorough and systematic inspection of vessels than heretofore has been possible with its limited force. These inspectors reported during August 2 cases of overcrowding of vessels, and in addition thereto 115 violations of the various other navigation laws.

TONNAGE MEASUREMENT.

The subject of tonnage measurement was considered at some length in this report for 1911 (pp. 28-42) and again in 1913 (pp. 35-36). The principal difference in the measurement of ships in the United States and in Great Britain, Germany, and other continental countries, as pointed out in those reports, is due to differences in the interpretation of the words "permanent closed-in space." These different interpretations have been carried for some years in the American regulations and the British regulations, and the subject can best be explained by quoting the pertinent portions of the laws and regulations, as follows:

AMERICAN LAW.

If there be a break, a poop, or any other permanent closed-in space on the upper deck, available for cargo, or stores, or for the berthing or accommodation of passengers or crew, the tonnage of that space shall be ascertained as follows and added to the gross tonnage: * * *

Provided, That nothing shall be added to the gross tonnage for any sheltered space above the upper deck which is under cover and open to the weather; that is, not inclosed.

BRITISH LAW.

If any ship, British or foreign, other than a home-trade ship as defined by this act, carries as deck cargo; that is to say, in any uncovered space upon deck, or in any covered space not included in the cubical contents forming the ship's registered tonnage, timber, stores, or other goods, all dues payable on the ship's tonnage shall be payable as if there were added to the ship's registered tonnage of the space occupied by those goods at the time at which the dues become payable.

(2) The space so occupied shall be deemed to be the space limited by the area occupied by the goods and by straight lines inclosing a rectangular space sufficient to include the goods.

(3) The tonnage of the space shall be ascertained by an officer of the board of trade or of customs in manner directed as to the measurement of poops or other closed-in spaces by rule 1, in the second schedule to this act, and when so ascertained shall be entered by him in the ship's official log book and also in a memorandum which he shall deliver to the master, and the master shall, when the said dues are demanded, produce that memorandum in like manner as if it were

the certificate of registry, or, in the case of a foreign ship, the document equivalent to a certificate of registry, and in default shall be liable to the same penalty as if he had failed to produce the said certificate or document.

AMERICAN REGULATIONS.

By "closed-in spaces" is to be understood spaces which are sheltered from the action of the sea and weather, even though openings be left in the inclosure. Measuring officers will exercise due vigilance that the intent of the law in this respect is not evaded.

ART. 87. *Shelter decks and upper decks.*—Whether for the purpose of measurement a deck is to be regarded as an upper deck or as the shelter to an upper deck is to be determined in each instance both by the character and structural conditions of the erection and by the purpose to which the between deck is devoted. Differences in construction are so numerous that no definition or rule on this subject has been formulated. If the deck is a continuous deck, fastened down and water-tight, sealing up the cylinder formed between the two decks and making it a fit place for the storage of cargo, like a hold, the deck is to be treated as an upper deck and the space between it and the deck below is to be measured.

If, however, the cylinder is open to the shipment of seas, and the space is not reasonably fit for the carrying of dry cargo, but is used only for cargo generally classed as deck cargo, such as cattle, horses, chemicals, oil in barrels, etc., then, usually, the deck is to be regarded as a shelter deck, and the space as "sheltered space above the upper deck which is under cover and open to the weather; that is, not inclosed," and not to be included in the recorded tonnage.

The British regulations, it will be noted, provide for the assessment of light dues, equivalent to tonnage dues, on deck cargoes, while the American law carries no authority for the imposition of such charges. The passage of the registry act of August 18, 1914, was accepted by the Bureau as evidence that Congress designed to bring about conditions of competition between American and foreign ships as nearly equal as practical, and that the act was, accordingly, an instruction to modify the regulations. In fact, the modification of the regulations in these respects had been under consideration for several months before the outbreak of the European war. On September 5, the following instructions were sent to collectors of customs:

Pending a revision of regulations concerning measurement of vessels (portions of arts. 82, 86, 87, Customs Regulations, 1908), you may receive and forward with your report under article 84 an application by the owner of any seagoing steam vessel of the United States for a review of the measurement on the ground that additions in the outstanding registers have been made to the gross tonnage for sheltered spaces above the upper deck (act of Mar. 2, 1895, sec. 1 (h)), which is under cover and open to the weather; that it is not inclosed.

BRITISH REGULATIONS.

In carrying out this direction, and deciding whether or not deck erections should be measured and added to the tonnage, the surveyor should have regard to the character and structural condition of such erections at the time when they are presented to his notice.

Poops, bridges, or any other permanent erections with one or more openings in the sides or ends not fitted with doors or other permanently attached means of closing, but otherwise so closed in as to be not only available, but also actually fitted and used for the berthing or accommodation of passengers, must be measured and added to the tonnage.

Subject to the foregoing exception, poops, bridges, or any other permanent erections with one or more openings in the sides or ends not fitted with doors or other permanently attached means of closing them, should not be measured and included in the tonnage. Whenever any portion of such erection is occupied by timber, stores, or other goods, the tonnage of such space is ascertained and recorded by the officers of customs and excise in accordance with section 85.

2. Owners should be advised that where a vessel is treated as a shelter-deck vessel, the freeboard, ascertained under foreign load-line laws and regulations and by the classification societies, will doubtless be measured downward from the line of the deck below the shelter deck.

3. Detailed instructions will follow, but, in general, poops, bridges, or any other permanent erections with one or more openings in the sides or ends not fitted with doors or other permanently attached means of closing them, should not be measured and included in the tonnage.

The number of American-built vessels in which there is a question as to whether spaces should be regarded as permanently closed-in spaces above the upper deck or as shelter-deck spaces is quite small, and up to this writing no applications for remeasurement have been made. This difference, however, would have affected a number of the foreign-built ships registered under the act of August 18. This change in the regulations, of course, affects equally American and foreign ships, and under normal conditions would result in a small reduction in tonnage tax receipts. The reduction from this source, however, will be slight by comparison with the considerable reduction resulting from the temporary decline of foreign trade by sea in consequence of the general war in Europe.

LONDON INTERNATIONAL CONFERENCE.

The International Conference on Safety of Life at Sea met in London from November 12, 1913, to January 20, 1914, when a comprehensive convention was signed by the representatives of the United States and the following 12 foreign maritime nations: Austria-Hungary, Belgium, Denmark, France, Germany, Great Britain, Italy, Netherlands, Norway, Russia, Spain, and Sweden. The convention was transmitted by the President to the Senate on March 17, 1914, and awaits the advice and consent of that body to its ratification. The international convention is the most important step ever taken by maritime nations to promote the safety of life at sea, and it is to be trusted that the Senate will consent to its ratification before December 31, 1914, when ratification, by the terms of the convention, were to be deposited at London. The convention was ratified by the German Reichstag in May, and the British Parliament passed on August 10 the bill to give effect to the convention. Before the outbreak of the European war in August the preliminary steps for ratification had been taken in France, Spain, the Netherlands, Belgium, Italy, Austria, and Hungary, and at that time ratification was expected in the early autumn. The parliaments of Denmark and Sweden do not assemble until early in 1915, so those powers can not ratify until that date. The war will undoubtedly delay until beyond July 1, 1915, the time when the convention shall go into effect, but legislation by Congress will be necessary after the convention shall have been ratified. The American delegation has submitted a full report upon the convention, which has been printed as a Senate document.

SHIP-REGISTRY ACT OF AUGUST 18, 1914.

The first registry act of September 1, 1789, confined American registry to ships built in the United States. The right of American citizens, however, to own vessels built abroad has never been questioned, and was very clearly affirmed in the letter of Thomas Jeffer-

son, Secretary of State, May 3, 1793. The policy of encouraging domestic shipbuilding adopted in the first years of the Republic had for its purpose the development of means of national defense rather than of protection of domestic industry in the sense in which these words are used in tariff discussions. To give effect to this policy, Congress at the outset passed legislation providing that only documented ships could engage in the trade of the United States, and divided these documents into three classes: First, the register for general purposes of trade and obligatory in foreign trade; second, the enrollment for vessels in the coasting trade; and third, the annual license authorizing a vessel for a year to engage in the coasting trade or in the fisheries, respectively.

Vessels over 5 and under 20 tons were required to carry the license only. Foreign-built vessels owned by Americans could not lawfully carry any of these documents, and, accordingly, could not engage in any form of trade with American ports except under prohibitory penalties. While this registry law doubtless contributed to the increase of American shipbuilding in the earlier years of the Republic, for the last third of a century it has been utterly impotent to promote building in the United States of ships for the foreign trade. Without discussing reasons, a statement of the fact will suffice that modern steel ships for some years have been built more cheaply abroad than they could be built at home. Consequently, American capital desiring to invest in shipping has for years past purchased ships abroad. These ships could have sailed under the American flag in trade with all parts of the world except with the United States, where they would have been met with heavy penalties whether with cargo or in ballast.

All nations prescribe as a condition to the use of their flag on merchant vessels that the owner shall be a citizen or subject of the country whose flag the ship flies. The citizen or subject may be, however, an entity like a corporation created by the State of which practically all the shares of stock may be owned by individuals of other countries. To enable their foreign-built ships to engage in trade with the United States, American capitalists for years past have organized in foreign countries such corporations, retaining themselves, of course, practically all the shares.

The foreign-built ships representing American capital but under foreign ownerships of record for some years past have been nearly equal in tonnage to the ships registered under the American flag for foreign trade, and in carrying power have been even greater. For many years all these facts have been quite familiar to those who have given the subject attention. All efforts to repeal the law, which was economically a dead letter, received little attention until the Panama Canal act of August 24, 1912. Section 5 of that act provided for the admission to American registry for foreign trade and trade with the Philippines, Guam, and Tutuila, of foreign-built vessels, steam or sail, certified by the Steamboat-Inspection Service as safe to carry dry and perishable cargo not more than 5 years old at the time of registration.

An extension of this act, by repealing the 5-year age limit, was recommended by the Secretary of Commerce in March of the past fiscal year, and a bill to give effect to this recommendation was introduced in Congress but not acted upon until the outbreak of the European war brought forcibly home to all the embarrassing situation in which

we were placed by our own legislation. This legislation embarrassed us in the use of our own property at sea, which had been forced by it to employ flags and registers which conformed to statutes but not to actual ownership. Accordingly, the act of August 18, 1914, was passed. This act, though passed under stress of war, was in fact an inevitable development in the change of national policy which under ordinary conditions would have been effected as soon as Congress could have turned its attention to the subject. Under that act up to November 5 the following 80 ships of 278,374 gross tons have been registered:

FOREIGN-BUILT VESSELS ADMITTED TO AMERICAN REGISTRY UNDER THE ACT OF AUGUST 18, 1914.

| Rig. | Name of vessel. | Gross tons. | Home port. | Owner. | Former owner. | Former nationality. |
|--------|-----------------------------------|-------------|---------------------|--|--|---------------------|
| St. s. | Oceana..... | 7,796 | New York, N. Y. | Morse Dry Dock & Repair Co. | Bermuda Atlantic S. S. Co. (Ltd.) | British. |
| St. s. | Moldegaard..... | 2,852 | Wilmington, Del. | Ocean Freight Line (Inc.) | Ocean Freight Line (Inc.) | Do. |
| Bar. | W. Indrush..... | 1,531 | Boston, Mass. | Shepard & Morse Lumber Co. | W. Indrush Shipping Co. (Ltd.) | Do. |
| St. s. | Twines..... | 5,017 | New York, N. Y. | Twines S. S. Corporation | Tropical Fruit S. S. Co. (Ltd.) | Do. |
| St. s. | Trinidadian (tanker) ^b | 2,450 | Port Arthur, Tex. | Gulf Refining Co. | Trinidadian (Ltd.) | Do. |
| Sch. | Roseway..... | 291 | Mobile, Ala. | Alfred L. Staples | Arthur Gray | Do. |
| St. s. | Santa Rosalla..... | 5,409 | New York, N. Y. | U. S. Steel Products Co. | Isthmian S. S. Co. (Ltd.) | Do. |
| St. s. | Kentra..... | 4,982 | do. | do. | do. | Do. |
| St. s. | Bantu..... | 4,188 | do. | do. | do. | Do. |
| St. s. | Crofton Hall..... | 6,773 | do. | do. | do. | Do. |
| St. s. | Annie M. Reid ^c | 2,165 | San Francisco, Cal. | James Rolph, Jr. | Charles G. Dunn & Co. (Ltd.) | Do. |
| Bar. | San Francisco ^a | 5,102 | New York, N. Y. | U. S. Steel Products Co. | Isthmian S. S. Co. (Ltd.) | Do. |
| St. s. | Buena Ventura..... | 4,881 | do. | do. | do. | Do. |
| St. s. | Charlton Hall ^a | 4,749 | do. | do. | do. | Do. |
| St. s. | Crafter Hall..... | 4,319 | do. | do. | Charles G. Dunn & Co. (Ltd.) | Do. |
| St. s. | Howick Hall..... | 4,922 | do. | do. | do. | Do. |
| St. s. | Zacapa..... | 5,012 | do. | do. | do. | Do. |
| St. s. | Cartago..... | 4,937 | do. | Zacapa S. S. Corporation | Tropical Fruit S. S. Co. (Ltd.) | Do. |
| St. s. | Sixola..... | 5,017 | do. | Cartago S. S. Corporation | do. | Do. |
| St. s. | Brabant (tanker) ^d | 2,773 | Port Arthur, Tex. | The Texas Co. | do. | Do. |
| St. s. | Foxton Hall ^a | 4,246 | New York, N. Y. | U. S. Steel Products Co. | Continental Petroleum Co. | Belgian. |
| St. s. | Limon..... | 3,297 | do. | Limon S. S. Corporation | Charles G. Dunn & Co. (Ltd.) | British. |
| St. s. | Panuco (tanker) ^f | 2,556 | do. | Freeport & Tampico Fuel Oil Transportation Corporation | Tropical Fruit S. S. Co. (Ltd.) | Do. |
| St. s. | Pinar Del Rio ^g | 2,504 | do. | American & Cuban S. S. Line (Inc.) | Santa Clara S. S. Co. | Do. |
| Sch. | C. W. Mills..... | 3,371 | Mobile, Ala. | John George Murphy | Thomas Cuthbertson Thomson | Do. |
| St. s. | Brindilla (tanker) ^h | 4,274 | New York, N. Y. | Suriname S. S. Corporation | Tropical Fruit S. S. Co. (Ltd.) | Do. |
| St. s. | Turralba..... | 4,170 | do. | Standard Oil Co. | Deutsch-Amerikanische Petroleum Gesellschaft | German. |
| St. s. | Hecuba..... | 4,852 | do. | Murrah S. S. Corporation | Tropical Fruit S. S. Co. (Ltd.) | British. |
| St. s. | Hecuba..... | 5,011 | do. | Metapan S. S. Corporation | do. | Do. |
| St. s. | Hecuba..... | 5,011 | do. | Metapan S. S. Corporation | do. | Do. |
| St. s. | Esperanza..... | 3,297 | do. | Esperanza S. S. Corporation | do. | Do. |
| Ship. | A. Danziger..... | 1,573 | Rosier, Mass. | A. Von Shipping Co. (Inc.) | Yale Shipping Co. (Ltd.) | Do. |
| Ship. | Everett G. Griggs ⁱ | 4,954 | New York, N. Y. | Sterling Ship Co. | Tropical Fruit S. S. Co. (Ltd.) | Do. |
| Brn. | do. | 2,877 | Seattle, Wash. | Sterling Ship Co. | Everett G. Griggs Ship Co. (Ltd.) | Do. |
| St. s. | Corpenne..... | 3,191 | New York, N. Y. | Corpenne S. S. Corporation | Tropical Fruit S. S. Co. (Ltd.) | Do. |

^a Burned at Walling Island, Bahamas, Sept. 23, 1914.
^b Formerly Dutch st. s. ^a Ovegonne.
^c Formerly British st. s. ^b Le Hesbaya.
^d Formerly British st. s. ^c Saba.
^e Formerly German st. s. ^d Washington.
^f Formerly British ship Dunolly.
^g Formerly British bkn. ^e Lord Walseley.
^h Formerly British bkn. ^f Lord Walseley.
ⁱ Formerly German st. s. ^g Geestmunde.

FOREIGN-BUILT VESSELS ADMITTED TO AMERICAN REGISTRY UNDER THE ACT OF AUGUST 18, 1914—Continued.

| Rk. | Name of vessel. | Gross tons. | Home port. | Owner. | Former owner. | Former nationality. |
|--------|--------------------------------------|-------------|---------------------|-------------------------------------|---|---------------------|
| Bark. | Snowdon ^a | 1,111 | Boston, Mass. | Snowdon Shipping Co. (Inc.) | Snowdon Shipping Co. (Ltd.) | British. |
| Ship. | Hilston..... | 2,087 | Mobile, Ala. | James J. Feore..... | Hilston Ship Co. (Ltd.) | Do. |
| St. a. | Platonia (tanker) ^b | 3,445 | New York, N. Y. | Standard Oil Co. | Deutsch-Amerikanische Petroleum Gesellschaft | German. |
| St. a. | C. A. Canfield (tanker)..... | 6,350 | Los Angeles, Cal. | Petroleum Transport Co. | Petroleum Carriers (Ltd.) | British. |
| St. a. | Parimima..... | 4,937 | New York, N. Y. | Parimima S. S. Corporation | Tropical Fruit S. S. Co. (Ltd.) | Do. |
| St. a. | Almirante..... | 5,010 | do. | Almirante S. S. Corporation | do. | Do. |
| St. a. | Atenas..... | 4,981 | do. | Atenas S. S. Corporation | do. | Do. |
| St. a. | San Jose..... | 3,296 | do. | San Jose S. S. Corporation | do. | Do. |
| St. a. | Motano (tanker) ^c | 2,730 | do. | Standard Oil Co. | Deutsch-Amerikanische Petroleum Gesellschaft | German. |
| St. a. | Caloria (tanker) ^d | 4,065 | do. | do. | do. | Do. |
| St. a. | Louise M. Richard ^e | 4,411 | Gulport, Miss. | Ernest H. Richard..... | Albert Magnus Miller..... | British. |
| St. a. | Marowijne..... | 3,191 | New York, N. Y. | Marowijne S. S. Corporation | Tropical Fruit S. S. Co. (Ltd.) | Do. |
| St. a. | Saramacca..... | 3,293 | do. | Saramacca S. S. Corporation | do. | Do. |
| St. a. | Norman Bridge..... | 4,238 | Los Angeles, Cal. | Petroleum Transport Co. | Petroleum Carriers (Ltd.) | Do. |
| St. a. | Santa Marta..... | 5,013 | New York, N. Y. | Santa Marta S. S. Corporation | Tropical Fruit S. S. Co. (Ltd.) | Do. |
| St. a. | Carrillo..... | 5,012 | do. | Carrillo S. S. Corporation | do. | Do. |
| St. a. | Pastores..... | 7,781 | do. | Pastores S. S. Corporation | do. | Do. |
| St. a. | Calamares..... | 7,782 | do. | Calamares S. S. Corporation | do. | Do. |
| St. a. | Tenadores..... | 7,782 | do. | Tenadores S. S. Corporation | do. | Do. |
| Ship. | Brynghida..... | 1,502 | Boston, Mass. | Brynghida Shipping Co. (Inc.) | Harvard Shipping Co. (Ltd.) | Do. |
| Ship. | Pass of Balmaha..... | 1,571 | do. | Pass of Balmaha Shipping Co. (Inc.) | Ship Pass of Balmaha Co. (Ltd.) | Do. |
| Ship. | Rhine..... | 1,690 | do. | Rhine Shipping Co. (Inc.) | Rhine Shipping Co. (Ltd.) | Do. |
| St. a. | Orleanian ^f | 2,263 | New York, N. Y. | Orleanian S. S. Corporation | Tropical Fruit S. S. Co. (Ltd.) | Do. |
| Bge. | Glenhuig..... | 1,934 | Port Arthur, Tex. | The Texas Co. | Continental Petroleum Co. | Belgian. |
| Bge. | France Marie ^g | 1,994 | do. | do. | do. | Do. |
| St. a. | Wico (tanker) ^h | 2,748 | New York, N. Y. | Standard Oil Co. | Deutsch-Amerikanische Petroleum Gesellschaft | German. |
| St. a. | Dochra ^a | 4,309 | do. | Barber & Co. | La Plata S. S. Co. (Ltd.) | British. |
| St. a. | Llama (tanker) ⁱ | 3,180 | do. | Standard Oil Co. | Deutsch-Amerikanische Petroleum Gesellschaft | German. |
| St. a. | Edward L. Doheny (tanker)..... | 6,170 | Los Angeles, Cal. | Petroleum Transport Co. | Petroleum Carriers (Ltd.) | British. |
| St. a. | Sacramento ^j | 5,692 | San Francisco, Cal. | Northern & Southern S. S. Co. | Hamburg-Amerikanische Packetfahrt Actien-Gesellschaft | German. |
| Bge. | Turpan ^k | 869 | Port Arthur, Tex. | The Texas Co. | Continental Petroleum Co. | Belgian. |
| Bge. | Panuco ^l | 846 | do. | do. | do. | Do. |
| St. a. | Herbert G. Wylie (tanker)..... | 4,292 | Los Angeles, Cal. | Petroleum Transport Co. | Petroleum Carriers | British. |
| Bkn. | Skoda..... | 744 | Mobile, Ala. | Charles S. Boddien..... | Lester Ashley Boddien..... | Do. |
| Bark. | Pilgrim ^m | 1,629 | Boston, Mass. | Pilgrim Shipping Co. (Inc.) | Gael Shipping Co. (Ltd.) | Do. |
| Ship. | Timandra..... | 1,579 | do. | Timandra Shipping Co. (Inc.) | Timandra Shipping Co. (Ltd.) | Do. |
| St. a. | Santa Clara ⁿ | 2,894 | New York, N. Y. | American & Cuban S. S. Line (Inc.) | Santa Clara Steamship Co. (Ltd.) | Do. |
| St. a. | Lavary ^o | 1,249 | do. | L. C. Gillespie & Sons..... | David Hamilton Billeloch..... | Do. |
| St. a. | Charles E. Harwood (tanker)..... | 3,178 | Los Angeles, Cal. | Petroleum Transport Co. | Petroleum Carriers | Do. |

| | | | | | | |
|--------|----------------------|-------|---------------------|-------------------------------|---------------------------------|-----|
| Bark. | Anna Maria d'Abundo. | 964 | Mobile, Ala. | McIntyre Lumber & Export Co. | Varian Outhbert Scott. | Do. |
| St. a. | Greenbrier. | 3,332 | New York, N. Y. | Greenbrier S. S. Corporation. | Tropical Fruit S. S. Co. (Ltd.) | Do. |
| Sch. | W. H. Baxter. | 899 | Mobile, Ala. | J. C. Peterson. | T. C. Thomson. | Do. |
| Bkn. | Stranger. | 623 | do. | Edward L. Whitney | Lester A. Boddien. | Do. |
| St. s. | Robert Dollar. | 5,356 | San Francisco, Cal. | Robert Dollar Co. | Dollar S. S. Lines (Ltd) | Do. |
| Bkn. | St. Paul. | 471 | Mobile, Ala. | George J. Santa Cruz | T. C. Thomson. | Do. |

• Consular certificate.

- Formerly German st. a. Diamant.
- Formerly German st. a. Standard.
- Formerly German st. a. Chatham.
- Formerly British sch. Earl Gray.

/ Formerly British st. a. Alene.

- Schooner rigged.
- Formerly German st. a. Paula.
- Formerly German st. a. Brilliant.
- Formerly German st. a. Alexandria.

• Formerly British bark Bolivia.

- Formerly Dutch bark Henriette Haasman.
- Formerly British bark Gael.
- Formerly British st. a. Savan.
- Formerly British st. a. Harlech.

The penalties on foreign-built vessels owned by Americans under the old system of promoting shipbuilding no longer have reason for existence and should be repealed. Until repealed they merely call for the perfunctory exercise of administrative clemency.

Under the act of August 18, 1914, foreign-built ships certified by the Steamboat-Inspection Service as safe to carry dry and perishable cargo may be admitted to registry for foreign trade and trade with the Philippines, Guam, and Tutuila. Foreign-built ships not so certified under the policy enunciated by Jefferson and set forth in Article XX of the Consular Regulations can carry the American flag but are not eligible for registry. In time it will be desirable to repeal the requirement for preliminary certification of seaworthiness and substitute for it the general system of inspection under the laws which have been suspended by Executive order until September 4, 1916, in the case of foreign-built vessels admitted to registry.

The act of March 3, 1813, prohibited the employment on board of any of the public or private vessels of the United States of any person or persons except citizens of the United States, or persons of color, natives of the United States, and the act of March 1, 1817, prohibited the payment of fisheries bounties to vessels unless the officers and at least three-fourths of the crew were citizens of the United States or persons not the subjects of any foreign prince or state. The act of May 31, 1830, exempted from tonnage duties vessels of the United States of which the officers and two-thirds of the crew were American citizens. This gradual decrease in the rigid requirement of citizenship of all those employed on vessels of the United States culminated in the act of June 28, 1864, which repealed the requirements as to the citizenship of the crew, retaining only the provision "that officers of vessels of the United States shall be in all cases citizens of the United States." The limitation of crews to citizens was repealed as a necessary measure to the maintenance of the merchant marine.

Under the Executive order of September 4, 1914, pursuant to section 2 of the ship-registry act of August 18, 1914, the alien officers on ships admitted to registry may serve until September 4, 1921, and any vacancies may be filled without regard to citizenship up to September 4, 1916. In numerous cases the officers of these ships are American citizens and have been for some years. In 1854 Great Britain repealed the law requiring the officers and crews of British ships to be British subjects. In fact, until this act was passed the earlier act of 1849, giving British registry to ships built outside of British territory, had relatively slight effect. The laws of Germany, Norway, the Netherlands, Belgium, and Denmark also do not restrict the officers of merchant vessels of those nations to their own subjects. In fact, the rigid limitation of those employed on shipboard to citizens or subjects of the country whose flag the ship flies is not general outside of France, Italy, and Latin countries.

Respectfully,

EUGENE TYLER CHAMBERLAIN,
Commissioner.

TO HON. WILLIAM C. REDFIELD,
Secretary of Commerce.

NOTE.—The report of the Commissioner of Navigation, as separately published, contains also the following appendixes and statistical tables:

APPENDIXES.

- (A) Reports of shipping commissioners for year ended June 30, 1914—(1) Shipments, discharges, and expenditures; (2) Shipments and reshipments of seamen; (3) Number of men discharged; (4) Nationality of seamen; (5) Failures of seamen to join American vessels; (6) Men shipped to be discharged in foreign ports; (7) Allotments of wages; (8) Seamen shipped and discharged by collectors.
- (B) Wages of seamen—(1) Average monthly wages paid in the American merchant marine, year ended June 30, 1914; (2) Average monthly wages paid to able seamen on American vessels, 1895-1914; (3) Average monthly wages paid to first mates on American vessels, 1895-1914; (4) Average monthly wages paid to firemen and first engineers on American steam vessels, 1895-1914.
- (C) Shipments, discharges, and desertions of seamen from American vessels abroad—(1) Summary of shipments, discharges, and desertions; (2) Shipments, discharges, and desertions, by ports.
- (D) Tonnage tax—Law and collections—(1) Tonnage-tax collections, 1897-1914; (2) Tonnage tax collected, fiscal year ended June 30, 1914, by customs districts; (3) Tonnage tax collected, fiscal year ended June 30, 1914, by nationality of vessels.
- (E) Steel ship building in the United States—(1) Construction of steel steam vessels in the United States; (2) Steel vessels building or contracted for on July 1, 1914; (3) Price of steel ship plates in United States and Great Britain.
- (F) The world's tonnage, motive power, and materials of construction—(1) World's tonnage, based on official returns, 1850-1911 (from Return on Progress of British Shipping for 1912); (2) Number and net and gross tonnage of steam and sailing vessels as recorded by the Bureau Veritas for 1913-14; (3) Number and net and gross tonnage of steam and sailing vessels of over 100 tons, of the several countries of the world, as recorded in Lloyd's Register for 1914-15; (4) Motive power and chief materials of construction of the world's merchant marine, 1890-1914 (Lloyd's); (5) Total number and tonnage of steam vessels (over 100 tons) and sailing vessels (over 50 tons), 1890-1913 (Bureau Veritas); (6) Construction—Vessels built in the world (over 100 tons) according to Lloyd's (including vessels not recorded in Lloyd's), during 10 recent years; (7) The world's shipbuilding in 1913 (Lloyd's summary); (8) Vessels under construction June 30, 1914 (Lloyd's); (9) Number, tonnage, and nationality of vessels totally lost, condemned, etc., during the year 1913, as reported up to July 14, 1914; also the number and tonnage of steam and sailing vessels owned in each country.
- (G) Progress of British, German, and Japanese shipping.
- (H) Registered steam vessels of the United States on June 30, 1914.
- (I) Square-rigged American vessels.
- (J) Foreign-built yachts—Tax levied at the rate of \$7 per gross ton under authority of section 37 of the act of August 5, 1909, and collected during the fiscal year 1914.
- (K) Radio-service statistics—(1) Class and number of radio-station licenses issued; (2) Grade and number of radio-operator licenses issued; (3) Names of vessels and number of inspections.
- (L) State taxation of ships.
- (M) Miscellaneous—(1) Foreign carrying trade of the United States, 1821-1914; (2) Tonnage of American and foreign vessels entered and cleared in the foreign trade of the United States, fiscal years 1821-1914.

STATISTICAL TABLES.

- (1) Number and gross tonnage of documented vessels of the United States, by customs districts, June 30, 1914.
- (2) Number and gross tonnage of documented vessels of the United States, by States and Territories, June 30, 1914.
- (3) Number and gross tonnage of documented steam vessels of the United States, by customs districts, June 30, 1914.
- (4) Number and gross tonnage of documented metal vessels of the United States, by customs districts, June 30, 1914.
- (5) Number and gross tonnage of documented steam metal vessels of the United States, by customs districts, June 30, 1914.

- (6) Class, number, and gross tonnage of metal vessels of the United States, by customs districts, June 30, 1914.
- (7) Number and gross tonnage of each class of documented wooden and metal vessels of the United States, June 30, 1914.
- (8) Balance sheet of tonnage accounts, showing the increase and decrease in documented vessels, June 30, 1914.
- (9) Balance sheet of tonnage accounts, showing the increase and decrease in each class of vessels, June 30, 1914.
- (10) Documented sailing and steam tonnage constituting the total merchant marine of the United States, 1789-1914.
- (10a) Number and gross tonnage of canal boats and barges documented in the United States, in specified years, 1868-1914.
- (10b) Number and gross tonnage of sailing vessels, steam vessels, canal boats, and barges documented on the northern lakes, in specified years, 1868-1914.
- (11) Number and gross tonnage of sailing vessels, steam vessels, canal boats, and barges in the United States, by customs districts, June 30, 1914.
- (12) Number and gross tonnage of sailing vessels, steam vessels, canal boats, and barges in the United States, by States, June 30, 1914.
- (13) Sailing and steam vessels of the United States, according to size, June 30, 1914.
- (14) Number and gross tonnage of vessels of the United States engaged in the cod and mackerel fisheries, by customs districts, June 30, 1914.
- (15) Number and gross tonnage of vessels of the United States engaged in the whale fisheries, by ports, June 30, 1914.
- (16) Employment of the tonnage of the United States, June 30, 1914.
- (17) Documented tonnage of the United States merchant marine employed in the foreign trade, the coasting trade, and the fisheries, 1789-1914.
- (18) Class, number, and gross tonnage of vessels built in the United States and documented during year ended June 30, 1914, by customs districts.
- (19) Class, number, and gross tonnage of sailing vessels built in the United States and documented during year ended June 30, 1914.
- (20) Class, number, and gross tonnage of steam vessels built in the United States and documented during year ended June 30, 1914.
- (21) Class, number, and gross tonnage of steel vessels built in the United States and documented during year ended June 30, 1914.
- (22) Class, number, and gross tonnage of vessels built in the United States and documented, 1797-1914.
- (23) Number and gross tonnage of vessels built in the United States and documented, 1857-1914.
- (24) Class, number, and gross tonnage of metal vessels built in the United States and documented, 1838-1914.
- (25) Tonnage of vessels of the United States which have been built, admitted to registry by acts of Congress, etc., and those which have been lost, abandoned, sold to aliens, etc., 1813-1914.
- (26) Class, number, and gross tonnage of documented yachts of the United States, by ports, June 30, 1914.
- (27) Class, number, and gross tonnage of documented metal yachts of the United States, by ports, June 30, 1914.
- (28) Class, number, and gross tonnage of yachts built in the United States and documented during year ended June 30, 1914, by customs districts.
- (29) Class, number, and gross tonnage of metal yachts built in the United States and documented during year ended June 30, 1914, by ports.
- (30) Class, number, and gross tonnage of documented yachts lost, abandoned, sold to aliens, etc., year ended June 30, 1914.

REPORT
OF THE
CHIEF OF THE APPOINTMENT DIVISION

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REPORT

OF THE

CHIEF OF APPOINTMENT DIVISION.

DEPARTMENT OF COMMERCE,
APPOINTMENT DIVISION,
Washington, August 25, 1914.

SIR: There is submitted herewith my annual report as Chief of the Appointment Division for the fiscal year ended June 30, 1914:

The close of the fiscal year found the Division housed (on the seventh floor) in the new Commerce Building at Nineteenth Street and Pennsylvania Avenue NW., which will probably be its quarters for several years.

The creation of the Department of Labor had the effect of taking away from this Division the general supervision over the appointment work of a personnel consisting of some 1,827 employees. In order to offset the reduction of work four persons—a clerk at \$1,400 per annum, a clerk at \$1,200 per annum, a clerk at \$900 per annum (detached from the Bureau of the Census), and a laborer at \$660 per annum—were taken off the roll of the Division. The force has been slightly augmented again, however, by the detail of two clerks (one at \$1,200 per annum and one at \$900 per annum) from the Bureau of the Census, and these details were made permanent employees of the Secretary's Office by the legislative, executive, and judicial act of July 16, 1914. Prior to the transfer of the bureaus to the Department of Labor the salary roll of the Division amounted to \$18,540 per annum, including one detail from the Bureau of the Census. On July 16, 1914, it amounted to \$16,200 per annum, with no details.

The increased demands for information, the frequent changes in the personnel, and the adoption of additional safeguards designed to protect the Government's interests more than counterbalance any saving which has been effected by the introduction of improved and more economical methods of operations. While some 31 employees have left the Division since it was originally created, usually to accept more remunerative employment, the force is now on a good working basis, each employee having specialized on the certain lines of work required in his position and adapted himself generally to the work of the Division. A large number have increased their usefulness in the Division by taking outside courses of study. The esprit de corps of the force is excellent. The loyalty and the devotion to duty of each employee have brought about a condition of team work that is productive of excellent results.

STATISTICS RELATING TO THE PERSONNEL.

The accompanying table shows by bureaus the number of permanent positions in the Department on July 1, 1914, and the increase or decrease in each bureau as compared with July 1, 1913. The figures do not include temporary appointments, nor do they include the following average number of employments, estimated from the monthly reports of changes, appointment to or employments in which is not made by the head of the Department, namely, persons engaged in rodding, chaining, recording, heliotropeing, etc., in field parties of the Coast and Geodetic Survey, of which there were 1,390; temporary employments in field operations of the Bureau of Fisheries, of which there were 4,549; mechanics, skilled tradesmen, and laborers employed under authority of Schedule A, Subdivision I, section 12, of the civil-service rules in the Lighthouse Service, of which there were 3,385; nor do they include approximately 158 enlisted men on vessels of the Coast Survey in the Philippines, paid by the Insular Government of the Philippine Islands. The total miscellaneous employments and enlistments thus enumerated were approximately 9,482.

| Bureau. | Statutory. | Non-statutory. | Total. | In District of Columbia. | Outside District of Columbia. | Increase (+) or decrease (-). |
|--|------------|----------------|---------|--------------------------|-------------------------------|-------------------------------|
| Office of the Secretary..... | 126 | ..... | 126 | 126 | ..... | - 13 |
| Bureau of the Census..... | 621 | 756 | a 1,377 | b 640 | 737 | + 1 |
| Bureau of Corporations..... | 63 | 70 | 133 | b 133 | ..... | + 6 |
| Bureau of Foreign and Domestic Commerce..... | 83 | 37 | 120 | 94 | 26 | + 12 |
| Bureau of Standards..... | 230 | 108 | c 338 | 296 | 42 | + 26 |
| Bureau of Fisheries..... | 392 | 5 | 397 | 80 | 317 | - 1 |
| Bureau of Lighthouses..... | 57 | 5,563 | d 5,620 | 42 | 5,578 | - 4 |
| Coast and Geodetic Survey..... | 246 | 482 | e 728 | b 264 | 464 | + / 381 |
| Bureau of Navigation..... | 40 | 61 | 101 | 28 | 73 | + 6 |
| Steamboat-Inspection Service..... | 196 | 69 | 265 | 9 | 256 | + 3 |
| Total..... | e 2,054 | 7,151 | 9,205 | 1,712 | 7,493 | + b 417 |

a Does not include 69 temporary special agents.

b Employees engaged in work in the field for a part of each year with headquarters in Washington are treated as within the District of Columbia.

c Does not include 5 members of the visiting committee.

d Includes the following positions, appointment to which is not made by the head of the Department: 1,575 (estimated) laborers in charge of post lights, 1,153 members of crews of vessels, and 448 (estimated) mechanics, skilled tradesmen, and laborers employed in field construction work in the Lighthouse Service and work of a similar character at the general lighthouse depot at Tompkinsville, N. Y., and 2 hull drafts-men (temporary) employed in the District of Columbia.

e Includes 372 positions on vessels filled by enlistment. Does not include 2 deck officers appointed for the survey season in Alaska.

f See note A.

g Provisions in the appropriation acts for legislative, executive, and judicial and sundry civil expenses for fiscal year ending June 30, 1915, approved July 16, 1914, and Aug. 1, 1914, respectively, result in a net decrease of 3 statutory positions.

h Decrease 18, increase 435, leaving a net increase of 417. The main item of decrease is shown in the Office of the Secretary and is due to the transfer on Oct. 16, 1913, of 13 positions to the Department of Labor, under the provisions of the act of May 1, 1913. The net increase of 417 is due to the inclusion of 372 positions on vessels of the Coast Survey, filled by enlistment, and heretofore reported among the miscellaneous employments; to the net increase in nonstatutory positions to the number of 43 and to 2 statutory positions (local inspectors at Los Angeles, Cal., Steamboat-Inspection Service), authorized under the provisions of the deficiency act, approved Oct. 22, 1913.

CHANGES IN THE PERSONNEL.

The following table gives a summary of changes in the personnel of the Department during the fiscal year ended June 30, 1914:

APPOINTMENTS, PROMOTIONS, AND REDUCTIONS.

| Bureau. | Appointments.* | | | | | | Promo- tions. | Reduc- tions. |
|---|-------------------|----------------|--------------------|--------|-----------------|-----------------|------------------|------------------|
| | Permanent. | | | | Tempo- rary. | Grand total. | | |
| | Competi- tive. | Ex- cepted. | Unclassi- fied. | Total. | | | | |
| Office of the Secretary. | 25 | 1 | 4 | 30 | 2 | 32 | 14 | 1 |
| Bureau of the Census. | 59 | ..... | 557 | 616 | 12 | 628 | 88 | 16 |
| Bureau of Corpora- tions | 15 | 7 | ..... | 22 | 2 | 24 | 54 | ..... |
| Bureau of Foreign and Domestic Com- merce | 17 | 27 | ..... | 44 | 33 | 77 | 35 | 4 |
| Bureau of Standards. | 106 | ..... | 7 | 113 | 38 | 151 | 131 | 1 |
| Bureau of Fisheries. | 33 | 18 | 18 | 69 | 28 | 97 | 45 | 12 |
| Bureau of Light- houses | 277 | 43 | 4 | 324 | 110 | 434 | 301 | 95 |
| Coast and Geodetic Survey | 51 | 6 | ..... | 57 | 57 | 114 | 118 | 6 |
| Bureau of Navigation | 18 | 4 | ..... | 22 | 11 | 33 | 12 | ..... |
| Steamboat - Inspec- tion Service | 13 | ..... | 2 | 15 | 4 | 19 | 10 | 1 |
| Total..... | 614 | 106 | 592 | 1,312 | 297 | 1,609 | 808 | 136 |

SEPARATIONS AND MISCELLANEOUS CHANGES.

| Bureau. | Separations. ^b | | | | | | Miscellaneous changes. ^c |
|---|---------------------------|------------|---------------|--------|---------------------------|--------------|-------------------------------------|
| | From permanent positions. | | | | From temporary positions. | Grand total. | |
| | Competitive. | Ex-cepted. | Unclassified. | Total. | | | |
| Office of the Secretary | 19 | 1 | 5 | 25 | 3 | 28 | 3 |
| Bureau of the Census | 57 | ..... | 551 | 608 | 1 | 609 | 49 |
| Bureau of Corporations | 11 | 3 | ..... | 14 | 1 | 15 | ..... |
| Bureau of Foreign and Domestic Commerce | 7 | 18 | ..... | 25 | 17 | 42 | 27 |
| Bureau of Standards | 43 | ..... | 6 | 49 | 42 | 91 | 72 |
| Bureau of Fisheries | 29 | 13 | 13 | 55 | 16 | 71 | 40 |
| Bureau of Lighthouses | 269 | 33 | 3 | 305 | 104 | 409 | 197 |
| Coast and Geodetic Survey | 35 | 1 | 2 | 38 | 44 | 82 | 40 |
| Bureau of Navigation | 10 | 3 | ..... | 13 | 12 | 25 | 11 |
| Steamboat-Inspection Service | 13 | ..... | 2 | 15 | 2 | 17 | 5 |
| Total | 493 | 72 | 582 | 1,147 | 242 | 1,389 | 444 |

^a Includes probationary appointments, appointments under Executive orders, reinstatements, transfers within the Department, transfers to the Department from other departments or independent establishments, and presidential appointments.

^b Includes separations by discontinuances without prejudice or removals on charges, resignations, deaths, discontinuance of probationary appointees, and transfers from the Department to other departments or independent establishments.

^c Includes changes of appropriation, name, designation, or official station; extensions of temporary appointments; cancellations and amendments of appointment certificates, etc.

PRESIDENTIAL POSITIONS FILLED DURING THE PRESENT FISCAL YEAR.

Vacancies in presidential positions have been filled during the fiscal year ended June 30, 1914, as follows:

| Position. | Compensation. | Authority. |
|--|---------------|----------------|
| Director of the Census ^a | \$6,000 | 32 Stat., 51. |
| Superintendent of Naval Construction, Bureau of Lighthouses ^b | 3,000 | 36 Stat., 827. |
| Supervising Inspector, Fifth District, Steamboat-Inspection Service, with headquarters at Boston, Mass. | 3,000 | R. S., 4404. |
| Supervising Inspector, Sixth District, Steamboat-Inspection Service, with headquarters at Louisville, Ky. ^c | 3,000 | Do. |

^a Appointment confirmed by the Senate June 26, 1913, and appointee commissioned on same date. Assumed office July 1, 1913.

^b Position filled by transfer of a classified competitive employee in the Lighthouse Service. Confirmation by Senate not required.

^c Position filled by promotion of a classified competitive employee in the same service.

PROMOTIONS.

In considering recommendations for promotions the Department in the past has utilized its efficiency records, which were obtained as a result of the investigations made in 1906, 1909, and 1911. No investigation has been made since 1911, because Congress has imposed upon the Civil Service Commission the duty of establishing an efficiency system for the various executive departments; and as the commission has not yet established such a system, the Department has no current efficiency records which might be used exclusively for the purpose stated. It can, and does, of course, consider the ratings taken in 1911, but only to a limited extent, owing to the numerous changes which have since occurred. It is the practice to give very close attention to the merits of individual cases, as submitted by bureau chiefs, who, in addition to any special reasons which exceptional cases may involve, support their recommendations by a certificate to the effect that the records of the various employees have been carefully considered, and that the persons recommended are most entitled to advancement by reason of their superior efficiency, the character of work on which they are engaged, etc. The policy of this Department in selecting officers and employees from the lower grades to fill vacancies in higher positions, whenever practicable, is proving an incentive to increased efficiency. As illustrative of the operation of this policy, attention is invited to the filling of two vacancies in presidential positions, one in the Bureau of Lighthouses and the other in the Steamboat-Inspection Service, by the promotion of persons who held positions in the competitive classified service.

EMPLOYEES DETAILED WITHIN THE DEPARTMENT.

In view of unusual increases in the volume of work, a shortage of regular employees, and for various other reasons, it often becomes necessary for the bureaus and divisions of the Department to secure the services of additional employees in order to meet the demands placed upon them. To meet such exigencies Congress has made provision for a flexible distribution of employees by authorizing the

head of each of the several executive departments to alter the usual assignment of the clerks and other employees among the various bureaus of his department, for periods not to exceed 120 days each, with authority for renewal, as he may find it necessary and proper to do, except such clerks and employees as are by law required to be exclusively engaged upon some specific work. (Sec. 166, R. S., as amended by the act of May 28, 1896, 29 Stat., 179.) In accordance with this provision of law and in order to meet the requirements of the service, 32 employees of the Department in the District of Columbia were on detail during the past fiscal year at various times, as shown in the following tabular statement. This statement does not include intradetails between the divisions and stations of the various bureaus nor other miscellaneous details, such as details to the General Supply Committee, loans, etc.

| Bureau. | Detailed from.* | | Detailed to.* | | Net loss. | | Net gain. | |
|--|-----------------|-------|---------------|-------|-----------|-------|-----------|-------|
| | Per-sons. | Days. | Per-sons. | Days. | Per-sons. | Days. | Per-sons. | Days. |
| Office of the Secretary: | | | | | | | | |
| Office proper..... | | | 2 | 216 | | | 2 | 216 |
| Office of the Chief Clerk..... | | | 13 | 1,240 | | | 13 | 1,240 |
| Disbursing Office..... | | | | | | | | |
| Appointment Division..... | 1 | 107 | 3 | 705 | | | 2 | 598 |
| Division of Supplies..... | | | | | | | | |
| Division of Publications..... | | | 7 | 772 | | | 7 | 772 |
| Bureau of the Census..... | 21 | 2,246 | 4 | 198 | 17 | 2,048 | | |
| Bureau of Corporations..... | 3 | 312 | | | 3 | 312 | | |
| Bureau of Foreign and Domestic Commerce..... | 3 | 466 | 1 | 169 | 2 | 297 | | |
| Bureau of Standards..... | 1 | 30 | 1 | 31 | | | | |
| Bureau of Fisheries..... | | | 1 | 173 | | | 1 | 173 |
| Bureau of Lighthouses..... | 1 | 282 | | | 1 | 282 | | |
| Coast and Geodetic Survey..... | 2 | 61 | | | 2 | 61 | | |
| Bureau of Navigation..... | | | | | | | | |
| Steamboat-Inspection Service..... | | | | | | | | |
| Total..... | 32 | 3,504 | 32 | 3,504 | 25 | 3,000 | 25 | 3,000 |

* In cases where the same person was detailed more than once, but not continuously, each detail is counted as being of a separate person.

STEPS TAKEN TO PROVIDE PLACES FOR CERTAIN EMPLOYEES SEPARATED FROM THE BUREAU OF THE CENSUS, THE BUREAU OF FOREIGN AND DOMESTIC COMMERCE, AND THE BUREAU OF PENSIONS OF THE DEPARTMENT OF THE INTERIOR.

By reason of the removal of the Bureau of the Census to the Commerce Building the labor, watch, char, carpenter, and engineer forces of the Bureau and the Office of the Secretary were consolidated, and it became necessary, therefore, to dispense with 28 subclerical positions in the Census Bureau at the close of the fiscal year.

The Department, as early as April 9, 1914, took up the question of providing for 25 employees (three vacancies existed at that time) whose services would not be required after June 30, 1914, by calling the matter to the attention of the various bureaus and the several departments with the request that in the event of the occurrence of suitable vacancies they consider for transfer thereto the employees affected. At the close of the fiscal year 24 of the employees had been provided for.

In acknowledging the receipt of the Department's letter with reference to the cases of the Census employees, the Department of the Interior invited attention to the contemplated reduction in the clerical and examining forces of the Bureau of Pensions, and requested that consideration be given to the matter of transferring some of those employees who would be affected to suitable positions in the Department of Commerce. That department furnished a list of 45 employees, showing their ages and qualifications, who could be transferred from the Pension Bureau, and copies of the list were sent to the various bureaus and offices of the Department with the request that they cooperate as far as practicable. Subsequently it furnished a second list of 57 employees whose services in the Pension Bureau would probably be discontinued by operation of law on July 1, 1914, and copies of this list were likewise sent to the various bureaus and offices for consideration in connection with the filling of any vacancies which might arise. At the close of the year five of the Pension Office employees had been provided for in the Department.

In the reorganization of the force of the Bureau of Foreign and Domestic Commerce, to meet the terms of the legislative, executive, and judicial appropriation bill, the number of subclerical employees was reduced from 11 to 5, thus abolishing 6 subclerical positions.

While the bill was pending in Congress, steps were taken along the same lines as in the cases of the Census employees, with the view to making provision for the 6 employees affected.

EFFICIENCY OF EMPLOYEES.

In 1906, 1909, and 1911 exhaustive inquiry was made regarding the efficiency of the employees of the Department, resulting in securing a complete efficiency record of each member of the personnel. This record has been found of considerable value in considering recommendations for the promotion of employees and for other purposes. In 1909 the Department addressed communications to its bureau officers requesting an expression of their views as to what, if any, had been the effect of the investigation and the resulting readjustment of salaries or other action in the cases of employees whose records showed them to be below the required standard of efficiency. Practically all of these officers were of the opinion that the result had been far reaching and highly beneficial.

It seems certain from the results obtained that investigations of this kind bring out certain information in regard to the employees which would not otherwise, in the usual course of administration, be known in the Office of the Secretary. The conclusion seems irresistible that they have had a salutary effect, and the fact that the number of cases requiring administrative or disciplinary action in 1911 was considerably below that of 1909 indicates that there was an improvement in the character of the work performed and in the personnel of the service generally.

Following precedent it would have been in order to take the efficiency records of the employees during the early part of the summer of 1913, but by reason of the passage of section 4 of the act approved August 23, 1912 (37 Stat., 360), it was provided that "the Civil Service Commission shall, subject to the approval of the President,

establish a system of efficiency records for the classified service in the several executive departments in the District of Columbia, based upon records kept in the departments and independent establishments, with such frequency as to make them, as nearly as possible, records of fact." In view of this legislation the Department decided to take no steps toward obtaining current efficiency records of the employees. In matters relating to the promotion and changes in status the records obtained in 1911 are considered, but it is recognized that by reason of the time that has elapsed, and on account of the changed conditions in the status of many employees, they have lost considerable of their original value.

In April, 1914, the Civil Service Commission was advised that unless the provision of the act of August 23, 1912, devolving upon it the establishment of a system of efficiency, was actually put into operation, it might be necessary for the Department to take another efficiency record of its employees to be used in the consideration of promotions and other changes recommended by bureau officers. The commission was unable to state definitely when the system prescribed by the act would go into effect, although an effort was made to secure such definite statement, both by correspondence and by personal conference with the president of the commission.

It was suggested by the commission that the Department take its own efficiency ratings until the commission was in a position to carry out the provisions of the law, but there were objections to this course of procedure, among which may be mentioned (1) that the Department could not tell what system the commission would adopt, and consequently any method of rating the efficiency selected by the Department might not, and probably would not, accord with that which would be eventually adopted by the commission, and used for like purposes by other departments; (2) that Congress having charged the commission by law with the duty of adopting a system of efficiency ratings, it seemed doubtful whether it would be proper for the Department to utilize its own appropriation for doing the work itself; (3) that the volume of work involved in the taking of efficiency ratings being very large, and since the work is by law charged upon the commission, it would be hardly fair to take from the Department an equivalent amount of time and attention that should be given to its regular administrative work; (4) that for any department to set out to adopt by itself a system of efficiency ratings might not only fail to accord with the views of other departments and the commission as to the quality of such ratings, but would be also open to the objection that it was done to promote the Department's purposes, to which objection the commission in making the investigation required of it by law would not be open.

The fact was recognized, however, that for the purpose of efficient administration the efficiency ratings which are now over three years old should be brought up to date as soon as practicable. The matter seemed to be of sufficient importance to bring to the attention of the President, and upon conference it was decided that in view of the law devolving upon the Civil Service Commission the duty of establishing a system of efficiency ratings, it might be productive of confusion if the Department were to act upon the suggestion of the commission with regard to keeping ratings independently of any system which was not supplied by it.

The efficiency of employees of the Department is believed to be on an unusually high plane. While the records taken in 1911 will probably be of service in considering recommendations for promotion and other changes, it is not believed that they should be accepted conclusively, but that the policy of the Department should be to consider them, in connection with other circumstances, when such action seems proper and justifiable.

REVOCATION OF SECTION 2 OF CIVIL-SERVICE RULE XII, RELATING TO REDUCTIONS, BY THE ACT OF AUGUST 24, 1912.

Section 2 of civil-service Rule XII, which requires in part that a person in the competitive service whose removal is proposed shall be furnished with a statement of reasons and be allowed a reasonable time for personally answering such reasons in writing, further provides that—

The above procedure shall be followed in like manner in any reduction in grade or compensation for delinquency or misconduct, but the procedure may be limited to the filing of a statement of reasons with the order for reduction if the reduction is for administrative reasons only.

The Civil Service Commission, in response to an inquiry from the Department, has expressed the view that this part of section 2 of Rule XII, being contrary to section 6 of the act of August 24, 1912 (37 Stat., 555), which provides merely for filing in the records of the proper department or office of "the reasons for reduction in rank or compensation," is revoked by the statute and is no longer in effect. Accordingly, an employee's reduction in grade or compensation, if not made because of political or religious opinions or affiliations, in violation of section 2 of civil-service Rule I, may be effected without other proceeding than the filing of a statement in the records of the Department showing the reasons for the reduction.

SUPERANNUATION, RETIREMENT, AND COMPENSATION FOR DISABILITY.

In spite of the occasional loss of aged employees, due usually to death or by resignation, superannuation still increases, thus accentuating the disadvantages of an impaired service, the discouragement of a retarded rate of promotion for young and deserving employees, and the feeling of unrest and perhaps dread of dismissal by those who are aware that the best service they are able to render does not reach the average standard of the younger employees of the same class and grade. While superannuation probably exists throughout the Department's service, it has been found difficult to obtain admissions of the actual conditions from the higher officials under whom they serve. Naturally, so far as may conscientiously be done, they are reluctant to make any statement which might lead to the separation from the service of those who have given the best years of their lives to the Government and who, if deprived of their income from it, would face poverty and want.

In both governmental and commercial centers the question of retirement on pensions of superannuated employees is rapidly becoming more generally recognized as a practical and profitable movement. That such a policy can be carried out so as to be ultimately a means

of economy to the Government has been demonstrated and as a good business proposition can scarcely be controverted. Plans for carrying out this policy have been adopted by the leading governments of Europe, and its growth among business corporations indicates the value of the results accruing from action along that line. It is found to effect not only immediate relief, but its benefits are seen in its influence on the younger and more active class of employees. It removes much of the incentive to seek other employment where the prospects are brighter; it induces many to render more nearly the maximum of service, and greatly increases the esprit de corps when it is known that the faithful employees may expect to be cared for after they have become incapacitated in the service. That a sentiment favorable to the retirement of such employees exists in Congress is manifest from the attempts that are made from time to time to secure legislation for the purpose. In the present Congress a bill (H. R. 14240) has been introduced providing for the organization of a "Federal retirement trust company" to carry out the provisions of the resolution, which includes the following:

That beginning with the passage of this Act, three per centum shall be deducted from the monthly salary, pay, or compensation of all civil employees of the Government.

That employees who have performed faithful service for ten years but less than eleven, who have reached the age of sixty years, or who are permanently incapacitated for duty, may be placed on the retired list with retired pay equal to ten-sixtieths of their annual salary, pay, or compensation. If they have served eleven years but less than twelve, they shall receive eleven-sixtieths, and one-sixtieth additional for each year of service up to forty years, when the maximum of forty-sixtieths shall be paid.

That until the profits of the said trust company and the said deductions shall guarantee to all civil employees retired pay as provided * * *, the Government shall grant the said retired pay in the form of pensions.

This bill has been referred to a committee, but as yet has not been reported. In extreme contrast to it, and indicating that the congressional sentiment is not unanimous, is another bill (H. R. 13172) which has for its object the limitation of tenure of office to 10 years and provides specifically that no pension or gratuity shall be paid employees.

In further evidence of the sentiment that greater consideration is due the Government employees, seven bills were introduced during the present Congress proposing to extend the protection given by the act of May 30, 1908 (35 Stat., 556), which grants to employees engaged in hazardous occupations the right to receive compensation for injuries received in the course of their employment. This legislation was extended by the act approved July 27, 1912 (37 Stat., 239), to cover employees of the Lighthouse Service whose duties are of a hazardous character.

Of the seven bills referred to one (H. R. 8480) provides for the extension of this protection to certain employees of the General Land Office and Geological Survey, one (H. R. 9594) covers employees of the Postal Service, four (H. R. 7026, H. R. 12673, H. R. 14994, and H. R. 15222) would extend the benefits of the law to Government employees generally, and the other (S. 5464) makes minor modifications of the original legislation.

The recognition of the fact that the largely increased cost of living, without any corresponding advance of pay, makes it more and more difficult for the average Government employee to provide for old

age and sickness, should lead to the early adoption of some protective measure for superannuated employees and provision for assistance when by reason of injury received in line of duty they are temporarily or permanently incapacitated for duty. Only by such measures can be overcome the steady loss to the Government of many of its most intelligent employees, who join the service with expectations of reward for efficient service, but who find that they may have to spend the greater part of their Government service in a state of partial stagnation and hopelessness for the future. They are therefore obliged, in self-interest, to use the service only as a means of acquiring an education which is later utilized outside of the Government service where prospects are more encouraging.

LEAVES OF ABSENCE.

The regulations governing leaves of absence of employees of the Department in the District of Columbia and, as far as practicable, of employees in the field service, which were in force at the beginning of the past fiscal year, had been in effect since January 1, 1909, but, in view of their brevity and in some instances uncertainty in meaning it became necessary at various times to change or explain certain of the provisions contained therein. During the year new regulations have been promulgated with a view to clearing up the misunderstanding as to their application and to making them conform with the existing laws relating thereto. The first draft was prepared in this Division, after which it was referred to a committee of clerks. The suggestions of this committee were reviewed by another committee consisting of the Chief Clerk of the Department, the Disbursing Clerk, and the Chief of the Appointment Division, and after receiving the unanimous approval of the two committees they were reviewed by the Secretary and the Assistant Secretary and approved by the former, under date of July 16, 1913, to be effective beginning August 1, 1913.

The new regulations are generally in line with the departmental practices which were in operation at the time of their adoption, one of the important changes being the reduction of the minimum charge for leave without pay from one-half day to one hour. This change was deemed desirable in view of the fact that the former practice had apparently worked a hardship in certain cases.

Since August 1, 1913, the date of their adoption, the regulations have been amended by the Department so as to permit of the accrual of leave for more than a year, in cases where, by reason of isolation of place of employment or of other peculiar circumstances, the general regulations worked a hardship on the employees. The changes are as follows:

To accrue for three years.—Magnetic observers in the Coast and Geodetic Survey when assigned for continuous periods at magnetic observatories outside the continental limits of the United States. Employees of the Bureau of Fisheries regularly employed on the Pribilof Islands, Alaska. (Authorized Dec. 26, 1913.)

To accrue for two years.—Assistants, aids, deck officers, watch officers, mates, surgeons, assistant surgeons, chief engineers, and nautical experts of the Coast and Geodetic Survey when serving under appropriate orders outside the continental limits of the United States and deprived by reason thereof of the opportunity of taking their annual leave in the United States without undue expense both to themselves and to the Government. (Authorized June 11, 1914.)

The Division has heretofore used an annual summary leave card providing space only on which to enter the monthly leave record for each employee during the current calendar year and yearly totals for the five years immediately preceding. In order to eliminate extra labor and to provide a more elastic, compact, and serviceable record, a card has been adopted by the Department, upon the recommendation of this Division, which provides space for entering the monthly summaries for a period of 10 years and on the reverse side thereof space is provided for entering the yearly totals in previous years. It will thus present in a condensed form the leave record of an employee throughout his whole service in the Department. It is proposed to install this new system at the beginning of the calendar year 1915.

In accordance with the usual practice of the Department, and following the provision in the leave regulations concerning the same, a list was prepared in February of this year showing the names of those employees who took substantially all of their annual and sick leave for the preceding three years. This list included the names of 18 employees, distributed among three bureaus, which was a decrease of 5 employees from the list prepared for the three years preceding (Department of Commerce and Labor), but, as compared with the same bureaus and offices which now constitute the Department, the list showed the same number of employees. Wherever practicable remedial measures were taken with a view to checking any tendency to the abuse of the sick leave privilege.

During the past fiscal year this Division also prepared a tabular statement showing, by bureaus, the total and average amount of annual and sick leave, stated separately and together, taken by the employees of the Department in the District of Columbia during the calendar year 1913. In the compilation of this statement only those employees were considered who served during the entire year and were entitled to the full allowance of 30 days of both annual and sick leave. In the count of the annual leave all periods of one-half day and over were counted as a full day and all periods of less than one-half day were omitted. The averages, arranged by bureaus, are as follows:

| Bureau. | Employees considered. | Annual leave. | | Sick leave. | | Total. | |
|--|-----------------------|---------------|----------|-------------|----------|-------------|----------|
| | | Days taken. | Average. | Days taken. | Average. | Days taken. | Average. |
| Office of the Secretary..... | 106 | 2,571 | 24.26 | 472 | 4.45 | 3,043 | 28.71 |
| Bureau of the Census..... | 576 | 16,563 | 28.76 | 4,852½ | 8.42 | 21,415½ | 37.18 |
| Bureau of Corporations..... | 113 | 3,232 | 28.60 | 555 | 4.91 | 3,787 | 33.51 |
| Bureau of Foreign and Domestic Commerce..... | 83 | 2,316 | 27.90 | 405 | 4.88 | 2,721 | 32.78 |
| Bureau of Standards..... | 185 | 4,907 | 26.52 | 756 | 4.09 | 5,663 | 30.61 |
| Bureau of Fisheries..... | 74 | 1,955 | 26.42 | 429 | 5.80 | 2,384 | 32.22 |
| Bureau of Lighthouses..... | 31 | 884 | 28.51 | 172 | 5.55 | 1,056 | 34.06 |
| Coast and Geodetic Survey..... | 168 | 4,868 | 28.97 | 821 | 4.89 | 5,689 | 33.86 |
| Bureau of Navigation..... | 25 | 678 | 27.12 | 86½ | 3.46 | 764½ | 30.58 |
| Steamboat-Inspection Service.. | 7 | 183 | 26.14 | 8½ | 1.22 | 191½ | 27.96 |
| Totals and averages..... | 1,368 | 38,157 | 27.89 | 8,557½ | 6.26 | 46,714½ | 34.15 |

A comparison with the figures for the calendar year 1912 (Department of Commerce and Labor with 1,545 employees considered), computed in the manner indicated in the above statement, shows a net increase of 0.10 day of annual leave and a net increase of 0.53 day of sick leave, thus making a total net increase of 0.63 day. A comparison of the figures for the present bureaus and offices of the Department with those for the same bureaus and offices for the calendar year 1912 (1,355 employees considered) shows a net increase of 0.08 day of annual leave and 0.47 day of sick leave, a total net increase of 0.55 day.

THE LAW OF APPORTIONMENT.

The act of January 16, 1883, to regulate and improve the civil service of the United States, provided, among other things, for the classification of all the offices, places, and employments to which it was applicable, for open competitive examinations, selection, and appointment according to grade from the persons graded highest, and the apportionment of appointments in the departments at Washington among the several States and Territories and the District of Columbia, upon the basis of population, as ascertained at the last preceding census. The intent of the framers of the act to insure an efficient administration of the affairs of the Government is emphasized in the declaration that appointments shall be apportioned as nearly as the conditions of good administration will warrant. In order to insure efficient administration it is essential that nominating officers have before them when making selection for appointment the names of well-qualified eligibles. The efficiency of the personnel is an important factor in an economical administration of public affairs, and it is not believed that the theory of a geographical division of appointments should be carried out to such a degree as to preserve an ideal the efficacy of which has long been questioned.

It is perhaps unfortunate from an administrative point of view that the interpretation placed at one time upon the laws of apportionment has been such that in some cases it has been necessary to select for appointment eligibles with comparatively low ratings when there were on the register the names of persons with higher ratings who, under the apportionment law and rule, were not considered as available for certification.

The exhaustive investigation in 1913 of the Civil Service Commission's methods of preserving an apportionment of appointments, made by the President's Commission on Economy and Efficiency, showed that a rigid division of appointments among the several States and Territories, according to population, was not in the interests of the service, and this commission recommended a plan of apportionment whereby the ratings of the eligibles as well as the condition of the apportionment would determine the question of priority of certification for appointment. A modification of the principle previously in force had already been adopted by the commission for certain positions of a scientific and technical nature and this was afterwards extended, probably as the result of the report of the President's commission, to other positions, although not to the extent recommended. The change seems to have worked an improvement in the personnel of the service.

DECISIONS OF THE COMPTROLLER OF THE TREASURY.

During the year the Comptroller rendered four decisions relating to the personnel of the Department. A brief abstract of the decisions follows:

(1) A temporary employee, whose term of appointment is limited to continue not longer than 30 days from the date of receipt of certification of eligibles for permanently filling the position, and who does not receive notice of the receipt of such certification prior to the expiration of the 30-day period, is entitled to pay up to and including the date on which he is notified. (Sept. 3, 1913.)

(2) Section 7 of the act of March 4, 1913 (37 Stat., 790), does not prohibit an increase in the rates of pay of employees at light stations so long as the increased rates are not in excess of those paid for like services during the preceding year at other light stations where the duties to be performed and the conditions to be met are practically the same. (Nov. 17, 1913.)

(3) Special agents in the Bureau of the Census, whose appointments provide that the compensation shall be paid "when actually employed, including Sundays and holidays intervening between days of actual employment," and who take leave without pay for a part of either the day preceding or following Sundays or holidays, or both, are entitled to pay for the intervening Sundays or holidays unless the leave for a portion of the preceding day extends over the intervening Sunday or holiday, in which case they would not be entitled to pay for the intervening day. (Feb. 13, 1914.)

(4) The question of increasing the compensation of a clerk in the Steamboat-Inspection Service at New York is not to be determined solely by the rates paid at that port during the preceding fiscal year. The pay may be fixed at a rate not in excess of that paid for the same or practically the same services rendered by clerks in other branches of the same service. (Mar. 6, 1914.)

COMPILATION OF DATA RELATING TO THE PERSONNEL.

One of the functions of the Appointment Division is the preparation of statistical statements concerning the personnel of the Department for departmental purposes, for statistical publications, or in response to requests from congressional committees, individual Members of Congress, and other sources. From the following statements, which by no means represent the total amount of statistical work for the year, some idea may be formed of the various kinds of data compiled:

Names, bureaus in which employed, designations, salaries, and places of employment of married couples.

Names, compensations, and dates of appointment of commercial agents employed in the Bureau of Foreign and Domestic Commerce.

Number, designation, compensation, and classification with respect to Civil Service Act and Rules, of permanent positions in Alaska, by bureaus (exclusive of positions on vessels of the Department, laborers in charge of post lights in the Lighthouse Service, and temporary employments).

Average amount of annual and sick leave, both separately and together, taken by employees of the Department in the District of Columbia during the calendar year 1913.

Employees of the Department in the District of Columbia who took substantially all of their annual and sick leave during the calendar years 1911, 1912, and 1913, arranged by bureaus and showing the amount of leave taken by them each year.

Data in re efficiency records, members of family in Department and superannuated employees, in connection with congressional investigation as to limited term of service and civil pensions.

Number of regular positions with salaries, under the Department, the compensation of which is less than \$1,095 per annum or \$3 per diem.

Names, bureaus in which employed, positions, and salaries of employees of the Department who have received injuries during fiscal years 1911, 1912, and 1913, and showing the date and nature of injury and dependent survivors in the case of death.

Names and designations, by bureaus, of employees of the Department employed in Alaska, exclusive of keepers, assistants, and laborers in the Lighthouse Service.

Number of employees, showing sex and color, employed in or with headquarters in the District of Columbia.

Names of native Norwegians who are employed by the Department in the District of Columbia.

Statements showing names and other data as to employees of the Department who claim legal residence in the following States: Alabama, Georgia, Mississippi, Missouri, New Jersey, and Washington.

EXECUTIVE ORDERS.

During the fiscal year the following Executive orders affecting the personnel were promulgated by the President:

1. Special exceptions to civil-service rules applying only to this Department:

September 17, 1913, authorizing the permanent appointment in the Coast and Geodetic Survey of a clerk at \$720 per annum. The person appointed under this order had given satisfaction in the position while serving under temporary appointment through certification by the Civil Service Commission, and a satisfactory eligible could not be obtained from the civil-service register to fill the position.

October 17, 1913, authorizing the appointment in the Bureau of the Census of a clerk at \$900 per annum. The exception was made on account of the character and special fitness of the person affected.

December 10, 1913, authorizing the appointment of a clerk in the Bureau of the Census at \$1,000 per annum. The person appointed had previously rendered satisfactory service in the Bureau.

December 22, 1913, authorizing the promotion of a classified laborer to clerk at \$1,200 per annum in the Bureau of Fisheries. The person recommended in this case had, without promotion, performed work of a character that justified much higher pay, and on account of his experience, exceptional ability, and skill was especially fitted for the position.

December 22, 1913, authorizing the appointment of a former employee of the Library of Congress and the Bureau of Science at Manila, as a clerk. The person had rendered excellent service in the Philippines, and the condition of her health made it necessary for her to leave these possessions two months before the expiration of the three-year period usually required for transfer.

March 19, 1914, waiving the provision of the civil-service rules, requiring six months' service after reinstatement, so as to permit of the transfer of a person to the position of clerk at \$900 per annum in the Bureau of Foreign and Domestic Commerce. The person reinstated was specially qualified in editorial work, and her transfer seemed especially desirable on account of her training and experience.

2. Miscellaneous orders:

July 26, 1913, authorizing the Director of the Census to perform the duties of Secretary of Commerce during the absence of the Secretary, the Assistant Secretary, and the Solicitor.

May 5, 1914, amending the Executive order of February 14, 1912, permitting employees in the executive civil service residing in certain incorporated municipalities adjacent to the District of Columbia to become candidates for or hold office therein, so as to include the incorporated municipality of Somerset, Md.

May 5, 1914, excusing such employees of the departments and independent Government establishments in the District of Columbia from official duties at 12 o'clock noon, as were members of organizations which were to participate in the parade in connection with the ceremony of unveiling the statue to the memory of Commodore John Barry.

May 26, 1914, amending the Executive order of February 14, 1912, permitting employees in the executive civil service residing in certain incorporated municipalities adjacent to the District of Columbia to become candidates for or hold office therein, so as to include the town of North Beach, Md.

June 2, 1914, authorizing the Director of the Bureau of Standards to perform the duties of the Secretary of Commerce during the absence of the Secretary, the Assistant Secretary, the Solicitor, and the Director of the Census.

June 9, 1914, ordering that from June 15 to September 15 of each year, until further notice, four hours, exclusive of luncheon, shall constitute a day's work on Saturdays for all clerks and other employees of the Federal Government, wherever employed;

and revoking all conflicting Executive or other orders, except the order of April 4, 1908, relating to certain naval stations: *Provided, however*, That this order shall not apply to any bureau or office of the Government, or to any of the clerks or other employees thereof, that may for special reasons be excepted by the head of the department, or where the same would be inconsistent with the provisions of existing law.

June 15, 1914, amending section 1 of Regulation II of the regulations governing the employment of unskilled laborers in Federal offices outside of Washington, D. C., so as to reduce the maximum age limit for admission to examination from 60 to 50 years.

June 15, 1914, (1) amending Rule X, section 10, so as to permit of the transfer of meritorious employees who had been forced out of the service after having served two years in the Philippines, the minimum requirement having theretofore been three years. (2) Incorporating in the rules as section 11 of Rule X the Executive order of September 27, 1907, authorizing the transfer of employees in the civil service of Porto Rico to that of the United States. (3) Amending Schedule A, Subdivision X, section 1, so as to permit the transfer of artisans who are citizens of the United States who have rendered one year's satisfactory service on the Isthmus of Panama, without examination, subject to the provisions of the civil-service rules. (4) Incorporating as section 13 of Rule X a provision which gives a classified status to exceptionally meritorious employees, who have rendered service beyond the seas in a civil capacity and those who have served as constabulary officers of the Philippine civil service seven years.

FILES AND RECORDS.

In accordance with the provisions of the act of March 4, 1913, creating a Department of Labor, all the papers and records in the possession of this Division which pertained exclusively to the business of the bureaus transferred to the Department of Labor were transferred to that department. The greater part of these papers and records, however, remained in the custody of this Division until September 30, 1913, as the Department of Labor was unable before that time to provide space for them.

CONSOLIDATION OF THE FILES.

During the past year the files of former employees of the Lighthouse Service and other bureaus of the Department were consolidated. This change eliminates to a large extent the possibility of misfiling, and reduces to a minimum the time spent in inserting and withdrawing files.

DESTRUCTION OF USELESS PAPERS.

The files of the Division are reviewed each year, as provided for by the act of February 16, 1889, for the purpose of recommending the destruction of useless papers and documents not needed in the transaction of the current business of the Department and which have no permanent value or historical interest.

During the past fiscal year there were destroyed one lot of applications for appointment or transfer, of date prior to January 1, 1911 (not including those for the more important positions); one lot of daily bulletins of changes in the personnel, for use of the press, of date prior to May 16, 1913 (on which date the practice of preparing this bulletin was discontinued); one lot of card records of the personnel (the records shown on these cards have been transferred to the more complete service-record card system now in operation); and one lot of card records of temporary employments of mechanics, laborers, etc., in connection with construction work in the Lighthouse Service, of date prior to November 21, 1907 (since which date no card record of such employments has been kept). The removal of these files saved the cost of new additional furniture.

THE LIGHTHOUSE SERVICE.

The work incident to appointment and personnel matters of the Lighthouse Service, covering as it does the administrative details relating to more than 5,000 employees, constitutes an important part of the duties of this Division. The new civil-service regulations have been in effect more than a year and their operation seems to have been satisfactory. The district system of certification, as incorporated therein, has proved to be particularly adapted to this service. Field officers and the Civil Service Commission's district secretaries have apparently been able to cooperate in interpreting the regulations, and the Department has seldom had occasion to question the regularity of selection or nomination for appointment.

The scarcity of properly qualified persons willing to accept appointment as officer of tenders required a change in the maximum age limit from 40 to 45 years for all such positions except cadet officer and cadet engineer. The position of watchman has been designated in the regulations as one for which an educational test is required. The Bureau, however, with the consent of the Civil Service Commission, considers for appointment to this position physically qualified persons in the field service with records for long and meritorious service in trades and mechanical positions who are no longer able to perform duties of an arduous nature and who, as a class, are incapable of passing the prescribed educational test. Watchmen thus appointed do not acquire a status for transfer or promotion to other positions or to other parts of the service.

A plan whereby, under unusual circumstances, lighthouse inspectors may nominate for appointment the eligible living nearest the place of employment without regard to such person's relative standing on the register is at present before the Civil Service Commission for consideration. If approved, the regulations will be amended so as to include a suitable paragraph specifying under what circumstances selection need not be made from the three highest available eligibles. With a view to extending similar privileges to per diem employees in the Lighthouse Service as are accorded to employees in other branches of the Government service, request was made in the estimates of appropriations for the fiscal year ending June 30, 1915, for authority to grant this class of employees 15 days' leave of absence with pay each year under rules prescribed by the Secretary of Commerce. (This authority was given in the act making appropriations for sundry civil expenses of the Government for the fiscal year 1915.)

The Division has aimed to cooperate with the Bureau in systematizing routine matters relating to the personnel of the service and has endeavored to maintain and further the high standard of efficiency heretofore established. The centralized system of conducting affairs, which has developed since the reorganization of the Lighthouse Service in 1910, has enabled the Department to keep in intimate touch with the details of the work. This has been conducive to an economical and efficient administration.

SERVICE RECORDS.

The service-record system, as explained in the last two annual reports, remains practically the same, although a few minor changes have been made. A card record has been introduced showing in detail the complement of each vessel of the Coast and Geodetic Survey. Index cards are now kept of permanent positions (not including those at light stations, on light vessels, and some special agents) in the field service of this Department. These are listed according to the States and cities in which they are located. No radical changes are needed in the present record system, as it is believed that since it has been operated very satisfactorily for some time it is equal, if not superior, to any other used in the Government service.

OUTLINES OF ORGANIZATION.

Under date of November 27, 1911, the President's Commission on Economy and Efficiency submitted a report to him containing detailed information in regard to the organization of the Government as of July 1, 1911. This report was in turn submitted to the heads of the various departments with the understanding that it was for use by officers of the Government in the current administration of public affairs. In the compilation of this report an outline of organization was prepared showing every working unit of the Government and the relation of one unit to another or others. In a supplementary report dated March 20, 1912, the commission recommended that the outline of organization prepared by it be made the basis of a system by which full and detailed information would at all times be available regarding the manner in which the Government is organized for conducting its work.

In accordance with recommendations contained in the above-mentioned report the Department, under dates of June 29, 1912, and November 12, 1912, transmitted to the Civil Service Commission outlines of organization as of April 1, 1912, and July 1, 1912, respectively, with the exception of those of the Lighthouse Service, which were transmitted on September 9, 1912, and November 20, 1912. The summaries of outlines, as of July 1, 1912, were forwarded to the Civil Service Commission under date of January 20, 1913. To facilitate keeping the reports up to date, a loose-leaf system was adopted, at the suggestion of the Commission on Economy and Efficiency, to accommodate the reports sent in semiannually by the various units of the Department. The latter, in turn, made a yearly report of the same to the Civil Service Commission, showing the organization as it existed at the end of each fiscal year.

The benefit derived proved wholly incommensurate with the labor involved and the time consumed in compiling, assembling, and indexing these reports. In a letter dated July 16, 1913, the President ordered a suspension of the practice for that year. The legislative, executive, and judicial act approved July 16, 1914, contained a provision authorizing and continuing the suspension until otherwise provided by law.

THE DISTRICT SYSTEM OF CERTIFICATION.

The regulations governing the certification and selection for appointment of employees in the field service, which were promulgated by the Department, with the approval of the Civil Service Commission, on October 24, 1912 (Department Circular No. 243), are still operative. Under these regulations the proper field officer, having secured the written authority of the district secretary, submits a nomination for temporary or permanent appointment directly to the bureau, which, upon approval, recommends to the Department the appointment of the nominee thus certified and selected. The regulations provide that, except in emergency cases, persons who are nominated for appointment must not be assigned to duty until the notice of appointment has been received from the Department. In this manner the Department is able to maintain a direct supervision over its personnel, not only in the District of Columbia, but in the field as well.

It is gratifying to report that during the past fiscal year no formal complaint has been lodged with the Department to the effect that the district system causes delays or is otherwise objectionable. It seems, therefore, that this system is meeting in a satisfactory manner the reasonable demands of the various field services, and there appears to be no particular objection to offer to it, at least at this time. The district system for filling certain positions in the Light-house Service is referred to in another part of this report.

CONNECTED CERTIFICATES OF ELIGIBLES.

Reference was made in my last annual report to connected civil-service certificates, and an example was cited as an illustration of the delays likely to result therefrom. Since that time, however, the Civil Service Commission has inaugurated a practice by which, when certifications are furnished in response to simultaneous requests for similarly qualified eligibles, the required number of names are furnished on the first certificate, and on the second certificate appear the same names, together with the addresses, and an additional name is furnished for consideration in the event one is selected from the first certificate. This enables the second bureau to communicate immediately with all of the eligibles and thereby expedite its selection. It is believed that if this practice is continued some of the more serious objections to connected civil-service certificates will be overcome.

POLICY OF DEPARTMENT WITH RESPECT TO CLAIMS OF INDEBTEDNESS AGAINST EMPLOYEES.

During the past fiscal year 21 cases of alleged nonpayment of debt were brought to the attention of the Department. This number seems surprisingly low when the size of the personnel is considered. The usual statement was requested from each employee against whom complaint was made, and it is gratifying to report that in a majority of instances immediate payment or arrangement satisfactory to all concerned was made.

The following statement shows the disposition of the cases handled:

| | |
|---|----|
| Claims paid or payment promised..... | 15 |
| No action by Department because of— | |
| (1) Usurious interest alleged to have been charged..... | 1 |
| (2) Justice of claims disputed..... | 5 |

The general policy of the Department in regard to claims of indebtedness is that it will not act as an agency for the collection of debts from its employees. The Department does not believe in retaining on its rolls persons who habitually neglect or refuse to pay their just debts, but its action in carrying out this policy is limited to determining whether employees' conduct in the matter of their indebtedness has been such as to call for disciplinary action. It is obviously impracticable for the Department to take up and pass upon the merits of the many claims which may be presented against employees, and for it to insist upon their paying such claims regardless of their merits would scarcely be equitable or warranted.

POLITICAL ACTIVITY.

On December 5, 1913, the Department issued a circular relating to the forms of political activity forbidden by the civil-service law and rules, and the illegal collection or payment of political assessments. The circular was based upon the prohibition contained in civil-service Rule I, section 1, which reads as follows:

No person in the executive civil service shall use his official authority or influence for the purpose of interfering with an election or affecting the results thereof. Persons who by the provisions of these rules are in the competitive classified service, while retaining the right to vote as they please and to express privately their opinions on all political subjects, shall take no active part in political management or in political campaigns.

The application of this rule, particularly its application to the forms of political activity which are forbidden, were carefully explained, and reference was made to the sections of the Criminal Code prohibiting a Federal officer or employee from being concerned in soliciting or receiving a political assessment, subscription, or contribution from any other Federal officer or employee. It has been the wish of the Department to cooperate with the Civil Service Commission in the application of the rule and statutes referred to, and a copy of the circular is furnished to each employee at the time of his appointment.

Three complaints of alleged political activity were filed against employees of the Department during the year. Upon investigation it was found that the complaints were not sustained.

BONDS.

The following table shows as of June 30, 1914, the number, character, and aggregate penalty of bonds of officers of this Department required by law or regulation to give bond to the United States.

| Number. | Title. | Aggregate penalty. | Reference to statute or regulation. |
|---------|---|--------------------|--|
| 33 | Special disbursing agent..... | \$459,000 | Sec. 3614, R. S. |
| 82 | Chief of party, Coast and Geodetic Survey. | 180,000 | Sundry civil appropriation act, approved June 23, 1913, and prior years. |
| 15 | Shipping commissioner, Bureau of Navigation. | 75,000 | Sec. 4502, R. S., as amended by the act of Apr. 26, 1906 (34 Stat., 137). |
| 1 | Disbursing clerk, Department of Commerce.* | 50,000 | Sec. 176, R. S. |
| 1 | Secretary, Bureau of Standards..... | 500 | Voluntary. See sec. 9, act of Mar. 3, 1901 (31 Stat., 1450). |
| 1 | Assistant in Charge of Office, Coast and Geodetic Survey. | 2,000 | Par. 270, Regulations and Instructions for the Government of the Coast and Geodetic Survey, effective Jan. 1, 1913 |
| | Total..... | 766,500 | |

* Bond of the Disbursing Clerk of the Department is subject to the approval of the Secretary of the Treasury, and all records pertaining thereto are kept in the Treasury Department.

During the fiscal year 43 bonds were furnished, 17 of this number being renewal bonds as required by the act approved March 2, 1895 (28 Stat., 808).

Respectfully submitted.

GEO. W. LEADLEY,
Chief of Appointment Division.

To Hon. WILLIAM C. REDFIELD,
Secretary of Commerce.

REPORT
OF THE
CHIEF, DIVISION OF PUBLICATIONS

775

REPORT

OF THE

CHIEF, DIVISION OF PUBLICATIONS.

DEPARTMENT OF COMMERCE,
DIVISION OF PUBLICATIONS,
Washington, September 16, 1914.

SIR: The following report concerning the work of the Division of Publications during the fiscal year ended June 30, 1914, is respectfully submitted.

To facilitate the making of comparisons, statistics given in this report, except as otherwise indicated, relate only to bureaus, offices, and services composing the present organization of the Department of Commerce, those for the bureaus and services transferred to the Department of Labor by the act of March 4, 1913, having been eliminated. It should be borne in mind, however, that the Bureau of the Census in 1914 for the first time participated largely in the allotment to the Department for printing and binding.

ALLOTMENT AND EXPENDITURES.

The act of June 23, 1913, making appropriations for the sundry civil expenses of the Government for the fiscal year ending June 30, 1914, and for other purposes, allotted to the Department \$525,000 for printing and binding during the fiscal year 1914. Of this sum \$84,000 was on June 30, 1913, transferred to the Department of Labor, in accordance with the requirements of the act approved May 1, 1913, entitled "An act making appropriations for certain expenses incident to the first session of the Sixty-third Congress, and for other purposes." There remained, therefore, a balance of \$441,000 available for the Department of Commerce. This amount (\$441,000) was an increase of \$111,021.94 over the amount available for the preceding year for the bureaus remaining in the Department of Commerce, the increase being granted by Congress so that the printing and binding for the Bureau of the Census, except that in connection with inquiries of the Thirteenth Decennial Census, could be paid for from the allotment to the Department. Excepting an expenditure of \$38,270.24 in 1913, this work heretofore has been paid for from separate appropriations. Of the \$441,000 available in 1914, \$410,700.77 was expended, leaving an unused balance on June 30 of \$30,299.23.

The increase in expenditures in 1914 over those in 1913 was \$80,725.85, or 24.46 per cent. Expenditures in 1914, however, include \$110,758.32 expended for the Bureau of the Census, while there was expended for that Bureau during the preceding year only \$38,270.24, other expenditures in 1913 being from appropriations for the Thirteenth Decennial Census. Excluding figures for the Bureau of the Census in both years, the increase in expenditures was but \$8,237.77, or 2.82 per cent.

The cost of unbilled and uncompleted work of the Department at the Government Printing Office on July 1, 1913, was \$36,686.50, which sum was a charge against the allotment for the fiscal year 1914. This was more than offset, however, by the work at the Printing Office on July 1, 1914, which it is estimated will cost \$42,953.41. Thus the estimated cost of unbilled and uncompleted work at the Government Printing Office on July 1, 1914, was \$6,266.91 in excess of the actual cost of such work at that office on July 1 of the preceding year.

During the fiscal year 1914 the Department issued on the Public Printer 3,084 requisitions for printing and binding, compared with 2,735 during the preceding fiscal year, an increase of 349. Of the requisitions issued in 1914 there remained at the close of business on June 30, 1914, 355 upon which deliveries of completed work had not been made, compared with 344 on the same date in 1913.

COST OF PRINTING AND BINDING, BY BUREAUS.

The following table shows the cost of printing and binding for each of the bureaus, offices, and services of the Department during the fiscal years 1913 and 1914, together with the increase or decrease for each bureau, office, and service and the estimated cost of the work on hand but not completed June 30, 1914:

| Bureau, office, or service. | Cost of work delivered. | | Increase (+) or decrease (-). | | Estimated cost of work not completed June 30, 1914. |
|---|-------------------------|-------------|-------------------------------|-----------|---|
| | 1913 | 1914 | Cost. | Per cent. | |
| Office of the Secretary (Secretary, Assistant Secretary, Solicitor, Chief Clerk, and Division of Publications)..... | \$19,408.28 | \$12,655.94 | -\$6,752.34 | - 34.79 | \$325.45 |
| Appointment Division..... | 396.05 | 383.58 | - 12.47 | - 3.15 | 58.54 |
| Disbursing Office..... | 1,133.42 | 908.09 | - 225.33 | - 38.41 | ----- |
| Division of Supplies..... | 363.75 | 506.43 | + 142.68 | + 38.96 | 6.39 |
| Bureau of the Census..... | * 38,270.24 | 110,758.32 | +72,488.08 | +189.41 | 12,730.72 |
| Coast and Geodetic Survey..... | 26,526.52 | 28,837.49 | + 2,310.97 | + 8.71 | 3,783.51 |
| Bureau of Corporations..... | 11,524.50 | 10,468.46 | - 1,056.04 | - 9.16 | 3,155.75 |
| Bureau of Fisheries..... | 12,897.91 | 12,687.49 | - 210.42 | - 1.63 | 2,346.99 |
| Bureau of Foreign and Domestic Commerce..... | 142,818.07 | 132,039.95 | -10,778.12 | - 7.55 | 5,948.76 |
| Bureau of Lighthouses..... | 20,219.62 | 25,560.31 | + 5,340.69 | + 26.41 | 2,990.51 |
| Lighthouse Service..... | 6,716.44 | 7,298.93 | + 582.49 | + 8.67 | 733.25 |
| Bureau of Navigation..... | * 12,130.37 | 12,473.34 | + 342.97 | + 2.88 | 113.97 |
| Shipping Service..... | 2,032.81 | 2,646.77 | + 613.96 | + 30.20 | 393.34 |
| Radio Service..... | 1,102.21 | 898.83 | - 203.38 | - 18.91 | 76.07 |
| Bureau of Standards..... | 18,278.49 | 28,063.31 | + 9,784.82 | + 53.57 | 3,973.54 |
| Office Supervising Inspector General, Steamboat-Inspection Service..... | 2,456.71 | 2,637.22 | + 180.51 | + 7.35 | 10.58 |
| Steamboat-Inspection Service..... | 6,767.34 | 8,768.90 | + 2,001.56 | + 29.58 | 3,582.05 |
| Customs Service..... | 6,932.19 | 13,353.41 | + 6,421.22 | + 92.63 | 2,221.06 |
| Total..... | * 329,974.92 | 410,700.77 | +80,725.85 | + 24.46 | 42,953.41 |

* In 1913 the allotment to the Department for printing and binding was reimbursed from other appropriations for the following expenditures: For the Radio Service, \$1,716.58; for the Bureau of the Census (for printing in connection with publishing statistics relating to cotton and tobacco), \$5,011.48; total, \$6,728.06.

SUMMARY OF EXPENDITURES, 1907-1914.

The following statement shows for each of the fiscal years 1907 to 1914 the amount available to the Department for printing and binding, the amount expended, the unused balance on June 30, and the cost of work not completed at the close of the year. Figures prior to 1913 include expenditures for bureaus and services transferred to the Department of Labor by the act of March 4, 1913, but do not

include those for the Bureau of the Census, which was provided for by separate allotments or appropriations. It is worthy of note that though the scope of the Department has expanded considerably in recent years its expenditures for printing and binding have remained practically stationary.

| Fiscal year. | Allotment. | Expenditures. | Unused balance. | Cost of work not completed June 30. |
|--------------|-------------------------|-------------------------|-----------------------|-------------------------------------|
| 1907..... | \$375,000.00 | \$382,195.05 | \$42,814.96 | \$34,749.24 |
| 1908..... | 375,000.00 | 342,062.36 | 32,037.64 | 47,055.59 |
| 1909..... | 375,000.00 | 374,939.91 | 60.09 | 20,139.26 |
| 1910..... | ^a 376,337.43 | ^a 361,530.43 | 14,807.00 | 42,535.98 |
| 1911..... | ^b 381,500.00 | ^b 375,575.02 | ^c 5,924.98 | 46,173.12 |
| 1912..... | 375,000.00 | 374,996.64 | 4.36 | 43,956.76 |
| 1913..... | ^d 329,978.06 | ^d 329,974.92 | 3.14 | 36,686.50 |
| 1914..... | 441,000.00 | ^e 410,700.77 | 80,299.23 | ^f 42,963.41 |

^a Of this amount \$1,337.43 was for supplies furnished the Bureau of the Census, which reimbursed the Department's allotment to that extent.

^b A special appropriation of \$6,500 for the printing of the World Trade Directory is included in this amount, the entire sum being expended for the publication.

^c On Apr. 16, 1913, the Public Printer notified the Department by letter that an overcharge of \$1,092.73 had been made against its printing and binding allotment on requisition 1813 for illustrations for the Report of the Commissioner of Corporations on the Lumber Industry, Part I, and that the amount had been placed to the credit of the Department's balance of its allotment for the fiscal year 1911. This accounts for the difference between these figures and those published heretofore.

^d The Department's allotment was reimbursed for printing and binding furnished the Bureau of Navigation for the Radio Service, costing \$1,716.58, from the appropriation "Enforcement of wireless communication laws, 1913," also for work furnished the Bureau of the Census, costing \$5,011.48, of which \$383.29 was reimbursed from the appropriation "Tobacco statistics, Bureau of the Census, 1913," and \$4,628.19 from the appropriation "Cotton statistics, Bureau of the Census, 1913."

^e The Bureau of the Census, for which \$110,758.32 was expended in 1914, did not participate in the Department's allotment prior to the fiscal year 1913, and in that year only \$38,270.24 was expended for it.

^f Estimated cost of work not completed June 30, 1914.

QUANTITY AND COST OF PRINTING AND BINDING, BY CLASSES.

The following statement shows the amount and cost of each class of work called for by requisitions on the Public Printer during the fiscal year 1914, and affords a comparison with the amount and cost of these classes during the preceding fiscal year:

| Class. | 1913 | 1914 | Increase (+) or decrease (-). | |
|--|----------------|----------------|-------------------------------|------------------|
| | <i>Number.</i> | <i>Number.</i> | <i>Number.</i> | <i>Per cent.</i> |
| Blank forms..... | 8,409,705 | 14,301,618 | + 5,891,913 | + 70.06 |
| Reports, pamphlets, etc..... | 7,267,545 | 7,634,930 | + 347,385 | + 4.77 |
| Letterheads..... | 1,171,500 | 1,789,000 | + 617,500 | + 52.71 |
| Envelopes..... | 35,045 | 347,250 | + 312,205 | + 890.87 |
| Circulars, notices, and summaries..... | 155,150 | 729,875 | + 574,725 | + 370.43 |
| Index cards..... | 553,700 | 1,620,200 | + 1,066,500 | + 192.61 |
| Guide cards and folders..... | 145,650 | 152,700 | + 7,050 | + 4.84 |
| Memorandum sheets..... | 4,686,000 | 1,525,000 | - 3,161,000 | - 67.46 |
| Blank books..... | 27,735 | 13,355 | - 14,380 | - 51.85 |
| Miscellaneous books (binding)..... | 2,575 | 4,530 | + 1,955 | + 75.92 |
| | <i>Cost.</i> | <i>Cost.</i> | <i>Cost.</i> | <i>Per cent.</i> |
| Blank forms..... | \$32,954.51 | \$45,226.19 | + \$12,271.68 | + 37.24 |
| Reports, pamphlets, etc..... | 274,562.23 | 338,247.73 | + 63,685.50 | + 23.20 |
| Letterheads..... | 1,512.23 | 2,962.95 | + 1,450.72 | + 96.98 |
| Envelopes..... | 159.32 | 311.61 | + 152.29 | + 95.59 |
| Circulars, notices, and summaries..... | 754.71 | 3,594.09 | + 2,839.38 | + 376.22 |
| Index cards..... | 685.50 | 1,339.47 | + 653.97 | + 96.40 |
| Guide cards and folders..... | 782.91 | 740.27 | - 42.64 | - 5.45 |
| Memorandum sheets..... | 2,331.28 | 1,214.55 | - 1,116.73 | - 47.97 |
| Blank books..... | 10,549.95 | 10,591.99 | + 42.04 | + .40 |
| Miscellaneous books (binding)..... | 4,169.86 | 5,890.27 | + 1,720.41 | + 41.26 |
| Miscellaneous..... | 1,509.42 | 581.66 | - 927.77 | - 61.47 |
| Total..... | 329,974.92 | 410,700.77 | + 80,725.85 | + 24.46 |

WORK OF EDITORIAL SECTION.

The work of the editorial section involves the editing or examination and preparation for the printer of manuscripts of all publications of the Department. Reprints of publications and job work of every description also receive careful scrutiny, and proofs of form letters and other work done on duplicating machines are read and revised.

Considerably more than three-fourths of the allotment to the Department for printing and binding is expended for its publications, and to obtain for this work the maximum of product for the minimum of expenditure is one of the more important functions of the Division. This can best be effected by carefully editing all manuscripts, which, besides determining the typographical form and style of the publications, should be done with a view to avoiding expensive correction and revision in proofs and to the elimination of matter that is unnecessary or not deemed worthy of publication by the Department. During the past year a number of the regular publications of the Department were revised with the purpose in mind of either improving their appearance or reducing their cost, or both, with the result that substantial economies have been effected. It is not always possible, however, with the present small force of editorial clerks, to give manuscripts the thorough critical reading that they should have before they are transmitted to the printer, though it is believed that the increases submitted in the estimate for the personnel of the Division for the fiscal year 1916 will, if granted, result in a more efficient handling of this class of work.

The following is a partial list of the more important publications in which changes in form or style were effected during the past year. In some instances these changes were suggested by the Division and in others they were suggested by the issuing bureaus, but in all cases there was hearty cooperation between the Division and the bureaus concerned.

Buoy List, Cedar Keys to the Rio Grande (Gulf Coast), Eighth Lighthouse District.—Size changed from quarto to octavo, in order to secure a more economical and convenient form. The octavo size will also be adopted for 15 other buoy lists, heretofore printed in quarto size, when new editions are ordered.

United States Coast Pilot (Atlantic Coast), Section D, Cape Henry to Key West.—Size changed from 7½ by 11½ inches to octavo. In future new editions of Coast Pilots and supplements thereto will be printed in octavo form.

Monthly Summary of the Foreign Commerce of the United States.—The use of black-face (or foreign) type was discontinued, box headings were reduced, and statistical statements were condensed by rearrangement. This publication for June, 1913, contained 130 pages, while the issue of one year later contained only 100 pages.

Exports of Domestic Breadstuffs, Cottonseed Oil, Food Animals, Meat and Dairy Products, Cotton, and Mineral Oils from Principal Customs Districts of the United States.—Some of the statistical statements in this monthly bulletin were rearranged, some were omitted, and the publication was reduced from 12 to 4 quarto pages.

Sailing Dates of Steamships from Principal Ports of the United States to Ports in Foreign Countries.—This monthly bulletin is largely

a duplication of information published by the Post Office Department, various steamship companies, and private organizations. It was therefore decided to discontinue the publication with the issue for December, 1914.

Specifications for the construction of vessels for the Lighthouse Service.—These pamphlets will hereafter be printed in octavo form, instead of quarto. The specifications for the lighthouse tender *Rose* (86 pages) was the first to be printed in the new form.

Advance Sheets from Monthly Summary of the Foreign Commerce of the United States, Showing Details of Imports and Exports, by Articles.—The printing of these statements in advance of the publication of the Monthly Summary, of which they were a part, was discontinued with the issue for April, 1914, an arrangement having been made with the Government Printing Office to expedite the printing each month of the Summary.

Commerce and Navigation of the United States.—Certain statistical statements were omitted from this annual volume for 1913, half titles and display headings eliminated, and the tables carefully edited with a view to condensation. Also the number of copies printed for the Department was reduced from 1,700 for the 1912 issue to 1,300 for the 1913 issue. The 1913 volume contained 903 pages and cost \$16,391.88, while the 1912 volume contained 1,342 pages and cost \$23,245. Ten separates, costing \$445.54, were also reprinted from the 1912 report, while only 3 separates, costing \$305.78, were reprinted from the 1913 report.

Fourth General Adjustment of the Precise Level Net in the United States and the Resulting Standard Elevations.—In adopting a smaller type and slightly rearranging tables for this publication, instead of following the print of a former pamphlet on the same subject, a copy of which was submitted with manuscript as a guide for form and style, a saving of approximately \$700 was effected. The later publication will also be used hereafter as a guide for other similar publications.

Statistical Abstract of the United States.—This volume for 1913 was reduced in edition, number of pages, and cost, compared with the volume for 1912, as follows: 1912—Edition, 2,400; pages, 836; cost, \$5,266.51. 1913—Edition, 2,100; pages, 720; cost, \$4,897.75.

Quarterly Statement of Merchandise Entered for Consumption in United States, and Duties Collected Thereon.—The use of black-face (or foreign) type, which adds considerably to the cost of composition, was discontinued and box headings condensed, thereby effecting a material saving in the cost of this publication.

DUPLICATING WORK.

The need for some means to duplicate and distribute circular letters, instructions, etc., quickly and economically led to the establishment of a duplicating plant in this Division a little over two years ago. The plant was established on a very small scale, but its usefulness was soon demonstrated and the equipment has been enlarged from time to time to meet the demands as they grew. The service is now freely utilized by practically all the bureaus and offices of the Department, and the best evidence of its value is afforded by a constant increase in production. What was therefore in the beginning

only an insignificant feature of the work of the Division has grown to be one of its more important and useful branches, although there has not been provided a sufficient personnel for it.

The centralization of the work in one of the offices of the Department, where it is practicable to maintain a trained force and adequate equipment, has proved a great convenience and effected considerable economy. The inexpensive process employed permits the duplication of many forms, for temporary use only, which would not justify the expense of printing, while the prompt execution of the work is an element of even greater importance.

The table given below shows the amount of work turned out by the section each month during the fiscal years 1913 and 1914. It will be noted that over $3\frac{1}{2}$ times as many pages were duplicated, more than $2\frac{1}{2}$ times as many requisitions were filled, and nearly twice as many copies were printed during 1914 as in the preceding year, while there was an increase in the personnel of but one employee, and this employee was not assigned to the Division until January 5, 1914.

| Month. | Requisitions. | | Pages. | | Copies printed. | |
|----------------|---------------|-------|--------|-------|-----------------|-----------|
| | 1913 | 1914 | 1913 | 1914 | 1913 | 1914 |
| July..... | 22 | 47 | 56 | 61 | 32,697 | 37,195 |
| August..... | 31 | 37 | 67 | 51 | 47,851 | 25,540 |
| September..... | 30 | 45 | 58 | 68 | 53,728 | 42,085 |
| October..... | 34 | 59 | 67 | 112 | 51,997 | 75,216 |
| November..... | 46 | 56 | 72 | 114 | 62,536 | 41,535 |
| December..... | 57 | 50 | 83 | 130 | 66,441 | 59,140 |
| January..... | 62 | 269 | 84 | 601 | 58,722 | 160,325 |
| February..... | 71 | 140 | 97 | 875 | 64,413 | 123,260 |
| March..... | 64 | 204 | 69 | 565 | 62,571 | 159,975 |
| April..... | 59 | 211 | 66 | 484 | 57,909 | 142,155 |
| May..... | 62 | 171 | 87 | 338 | 67,633 | 114,230 |
| June..... | 53 | 222 | 76 | 361 | 51,148 | 145,810 |
| Total..... | 600 | 1,691 | 882 | 3,150 | 677,746 | 1,176,366 |

In April, 1914, after a three months' trial consolidation, the duplicating plant of the Bureau of Foreign and Domestic Commerce was merged into that of the Division of Publications, and the detail to the Division of one employee of that Bureau (who was first assigned to the Division on January 5) to assist in the work of the duplicating section was made permanent. This consolidation has enabled the section to do more of this class of work than both plants could possibly have done acting as separate units. It is believed, therefore, that the further consolidation of the equipment and personnel now performing such work in other bureaus of the Department with that of this Division would be equally advantageous from the standpoints both of economy and of prompt execution of work.

During the latter part of the year there was also installed in the Division machinery which was utilized for folding, sealing, and mailing over half a million copies of various circulars and form letters for the several bureaus. Undoubtedly this work will largely increase as the bureaus become acquainted with and utilize the service. In addition there were printed, folded, sealed, and mailed an average for each working day of the year of over 1,000 copies of various form letters bearing the imprint of the Office of the Secretary.

PUBLICATIONS ISSUED.

There is submitted on the following pages a list of publications emanating from the Department during the last fiscal year. This list includes publications of the permanent Census but not those of the Thirteenth Census. It does not include publications ordered during the year but not delivered by the Public Printer up to June 30, 1914, while those ordered prior to July 1, 1913, but delivered during the last fiscal year appear therein. In other words, the list is confined to publications becoming available for distribution or use during the year, and includes congressional documents emanating from the Department and for the printing of which the Department's allotment for printing and binding usually was drawn upon, in accordance with the provisions of Public Resolution No. 13, approved March 30, 1906.

PUBLICATIONS EMANATING FROM THE DEPARTMENT OF COMMERCE, FISCAL YEAR
ENDED JUNE 30, 1914, BY BUREAUS.

OFFICE OF THE SECRETARY.

| Title and description. | Pages. | Edition. | Cost. |
|--|--------|----------------|----------------|
| Annual report of Secretary, 1913. 8vo..... | 151 | 3,100 | \$710.74 |
| Same [reprint]..... | 151 | 500 | 71.96 |
| Same [press proofs]..... | • 151 | 2,100 | 244.84 |
| Reports of Department, 1913. Report of Secretary and reports of bureaus [consolidated]. [Printed also as H. doc. 812, 63d Cong. 2d sess.] 8vo..... | 672 | 500 | 1,150.02 |
| Annual report of Chief, Appointment Division, 1913. 8vo..... | 39 | 350 | 132.11 |
| Annual report of Chief, Division of Publications, 1913. 8vo..... | 44 | 500 | 197.48 |
| List of publications of Department available for distribution. 9th edition. May 1, 1913. [Reprint.] 8vo..... | 63 | 500 | 21.47 |
| Same. 10th edition. Feb. 1914. 8vo..... | 69 | 1,000 | 245.80 |
| Department circulars [all 4to]: | | | |
| 236—Bureau of Navigation and Steamboat-Inspection Service [super- sedes 115, June 8, 1906; 129, Sept. 7, 1906; 188, Mar. 25, 1909; 190, Apr. 7, 1909; 191, Apr. 14, 1909; 207, June 9, 1910; 208, June 11, 1910; 223, Apr. 12, 1911; and 226, May 22, 1911; also Bureau circular 5, Steamboat- Inspection Service, July 8, 1907]. Regulation of motor boats. Feb. 15, 1912. [Reprint.]..... | 4 | 150,000 | 491.02 |
| 246—Bureau of Fisheries, Alaska Fisheries Service. Regulations for protection of fur-bearing animals in Alaska. Mar. 26, 1913. [Reprint.] Same. 2d edition. June 22, 1914. | 3 3 | 2,000 3,200 | 10.13 37.93 |
| 248 [supercedes 45, June 30, 1904; 148, Mar. 30, 1907; and 179, Dec. 1, 1908]. Regulations governing leaves of absence. July 16, 1913. | 4 | 5,000 | 35.20 |
| 249—Bureau of Navigation. Customs ports authorized to issue marine documents. July 21, 1913. | 1 | 1,700 | 10.91 |
| 250 [supercedes 209, June 7, 1910, and all bureau regulations in conflict therewith]. Department flags. July 22, 1913. | 2 | 1,200 | 11.70 |
| 251—Bureau of Fisheries, Alaska Fisheries Service [supercedes 42, May 10, 1904; 136, Nov. 27, 1906; 192, Apr. 24, 1909; and Alaska Fisheries Service circular 2, Mar. 10, 1911]. Laws and regulations for protec- tion of fisheries of Alaska. Aug. 19, 1913. | 5 | 2,200 | 29.92 |
| 252—Bureau of Fisheries, Alaska Fisheries Service. Regulations for protection of fur-bearing animals in Afognak Reservation, Alaska. Oct. 29, 1913. | 1 | 2,200 | 7.58 |
| 253 [supercedes 216, Oct. 5, 1910]. Illegal collection or payment of political assessments and forms of political activity forbidden by civil-service law and rules. Dec. 5, 1913. | 2 | 3,500 | 22.57 |
| 254—Bureau of Navigation. New York anchorage regulations. May 18, 1914. | 1 | 2,500 | 8.41 |
| Department of Commerce, condensed history, duties, and practical opera- tion of Department and its several bureaus and offices, with laws relating specifically thereto. July 1, 1913. 8vo..... | 211 | 1,000 | 1,064.10 |
| Same [with omission of laws]. 8vo..... | 63 | 5,000 | 154.40 |
| Same [reprint]..... | 63 | 5,000 | 108.85 |
| Travel regulations, effective Aug. 1, 1913. 16mo..... | 41 | 500 | 154.42 |
| Same [reprint]..... | 41 | 1,500 | 183.23 |
| Same [reprint with changes]..... | 41 | 500 | 72.66 |
| Catalogue of books and blanks furnished by Department to customs officers. [Feb. 3, 1914.] 8vo..... | 24 | 1,000 | 85.63 |
| Manual governing field services in preparation of requisitions for supplies. Apr. 20, 1914. 4to..... | 4 | 500 | 28.40 |

• Leaves.

PUBLICATIONS EMANATING FROM THE DEPARTMENT OF COMMERCE, FISCAL YEAR
ENDED JUNE 30, 1914, BY BUREAUS—Continued.

OFFICE OF THE SECRETARY—Continued.

| Title and description. | Pages. | Edition. | Cost. |
|---|--------|----------|---------|
| Response to resolution [relative to method of obtaining figures referring to cotton goods in table on page 39 of report on Foreign tariff systems and industrial conditions]. July 18, 1913. [Printed as S. doc. 134, 63d Cong. 1st sess.] 8vo..... | 3 | (a) | ..... |
| Joint letter from Secretary of Commerce and Secretary of Labor to chairman of Committee on Commerce relative to S. 4, to abolish involuntary servitude imposed upon seamen in merchant marine of United States while in foreign ports and involuntary servitude imposed upon seamen of merchant marine of foreign countries while in ports of United States, to prevent unskilled manning of American vessels, to encourage training of boys in American merchant marine, for further protection of life at sea, and to amend laws relative to seamen; presented by Mr. La Follette. Oct. 9, 1913. [Printed as S. doc. 211, 63d Cong. 1st sess.] 8vo..... | 8 | (a) | ..... |
| Letter acknowledging receipt of resolution relative to placing of buoys and channel marks in navigable waters of Buzzards Bay. Nov. 29, 1913. [Printed as S. doc. 245, 63d Cong. 1st sess.] 8vo..... | 1 | (a) | ..... |
| Response to resolution, information relative to buoying and marking navigable waters of Buzzards Bay, Mass. Dec. 3, 1913. [Printed as S. doc. 254, 63d Cong. 2d sess.] 8vo..... | 3 | (a) | ..... |
| Response to resolution, detailed statement of incoming and outgoing tonnage in foreign trade for each customs district in United States, fiscal year 1913 [showing country of departure and destination and nationality of vessels]. Apr. 15, 1914. [Printed as S. doc. 465, 63d Cong. 2d sess.] 4to..... | 13 | (a) | ..... |
| Schedule of useless executive documents in Department. July 2, 1913. [Printed as H. doc. 128, 63d Cong. 1st sess.] 8vo..... | 5 | (a) | ..... |
| Communication submitting clause for authority to use balance of appropriation for establishing beacon lights to mark dredged channel in Newark Bay, N. J. July 12, 1913. [Printed as H. doc. 141, 63d Cong. 1st sess.] 8vo..... | 2 | (a) | ..... |
| Claim for damages, which has been considered, adjusted, and determined to be due [Alfred Jelliffe] by Commissioner of Lighthouses. July 22, 1913. [Printed as H. doc. 154, 63d Cong. 1st sess.] 8vo..... | 2 | (a) | \$35.34 |
| Estimate of appropriation for subsistence, travel, and other expenses of detailed employees in Bureau of Census [for collection of statistics of public indebtedness, valuation, taxation, and expenditures]. July 23, 1913. [Printed as H. doc. 157, 63d Cong. 1st sess.] 8vo..... | 2 | (a) | ..... |
| Letter in reference to appropriation for beacon lights, Newark Bay, N. J. Sept. 6, 1913. [Printed as H. doc. 225, 63d Cong. 1st sess.] 8vo..... | 1 | (a) | 2.31 |
| Detailed explanations in regard to certain items [relating to Lighthouse Service] in Book of estimates of appropriations for 1915. Dec. 2, 1913. [Printed as H. doc. 345, 63d Cong. 2d sess.] 8vo..... | 3 | (a) | 7.62 |
| Detailed statements of contingent expenses of Department of Commerce and Labor and Department of Commerce, and general expenses of Bureau of Standards, July 1, 1911–Nov. 30, 1913 [and of expenses of Bureau of Fisheries, fiscal year 1913]. Dec. 4, 1913. [Printed as H. doc. 372, 63d Cong. 2d sess.] 8vo..... | 96 | (a) | 720.16 |
| Letter transmitting letters from Acting Commissioner of Navigation concerning items appearing in estimates of Bureau of Navigation for coming fiscal year. Dec. 11, 1913. [Printed as H. doc. 467, 63d Cong. 2d sess.] 8vo..... | 6 | (a) | 18.71 |
| Communication reporting claim for damages which has been considered, adjusted, and determined to be due Dennis-Simmons Lumber Co. for damage to barge Thomas P. Stran by collision with lighthouse tender Juniper. Sept. 1, 1913. Dec. 19, 1913. [Printed as H. doc. 486, 63d Cong. 2d sess.] 8vo..... | 2 | (a) | 3.65 |
| Urgent deficiencies in appropriations required for service [of Department], fiscal year 1914. Dec. 18, 1913. [Printed as H. doc. 498, 63d Cong. 2d sess.] 8vo..... | 3 | (a) | 7.59 |
| Statement of expense incurred by officers and employees of Department of Commerce in attending meetings or conventions of societies and associations, June 30–Dec. 1, 1913. Jan. 12, 1914. [Printed as H. doc. 561, 63d Cong. 2d sess.] 8vo..... | 2 | (a) | 10.52 |
| Estimates of appropriation for service of Coast and Geodetic Survey, fiscal year 1915. Jan. 12, 1914. [Printed as H. doc. 567, 63d Cong. 2d sess.] 8vo..... | 5 | (a) | 11.80 |
| Letter transmitting communication from certain steamship companies relating to provision for safeguarding of coast of Alaska. Jan. 12, 1914. [Printed as H. doc. 577, 63d Cong. 2d sess.] 8vo..... | 4 | (a) | 10.39 |
| Statement of expenditures in Coast and Geodetic Survey, fiscal year 1913. Jan. 13, 1914. [Printed as H. doc. 580, 63d Cong. 2d sess.] 8vo..... | 22 | (a) | 183.38 |
| Draft of bill to include in class of employees now entitled to benefit of workmen's compensation act employees of Coast and Geodetic Survey. Feb. 5, 1914. [Printed as H. doc. 708, 63d Cong. 2d sess.] 8vo..... | 2 | (a) | 3.80 |
| Urgent estimate of deficiency in appropriation for tabulating machines, Bureau of Census. Feb. 7, 1914. [Printed as H. doc. 714, 63d Cong. 2d sess.] 8vo..... | 2 | (a) | 4.02 |
| Estimates of additional appropriations for fish-cultural stations in Kentucky and South Carolina. Feb. 12, 1914. [Printed as H. doc. 731, 63d Cong. 2d sess.] 8vo..... | 3 | (a) | 7.88 |

* None printed for the Department.

PUBLICATIONS EMANATING FROM THE DEPARTMENT OF COMMERCE, FISCAL YEAR
ENDED JUNE 30, 1914, BY BUREAUS—Continued.

OFFICE OF THE SECRETARY—Continued.

| Title and description. | Pages. | Edition. | Cost. |
|--|--------|----------|---------|
| Detailed statement of number of documents received and distributed by Department, calendar year 1913 Feb. 12, 1914. [Printed as H. doc. 736, 63d Cong. 2d sess.] 8vo..... | 8 | (a) | \$60.66 |
| Communication reporting claim for damages which has been considered, adjusted, and determined by Commissioner of Lighthouses [in favor of Smith & McCoy]. Feb. 19, 1914. [Printed as H. doc. 756, 63d Cong. 2d sess.] 8vo..... | 2 | (a) | 3.65 |
| Letter submitting amendment to H. 12806, authorizing Secretary of War to grant use of Fort McHenry military reservation to mayor and city council of Baltimore, etc., giving Secretary of Commerce permission to maintain light and fog signal to mark channel. Feb. 20, 1914. [Printed as H. doc. 760, 63d Cong. 2d sess.] 8vo..... | 2 | (a) | 3.65 |
| Amended estimate of appropriation for Lighthouse Service, fiscal year 1914 [relating to item for establishment of light and fog-signal station at Kellett Bluff, Henry Island, Wash.]. Feb. 25, 1914. [Printed as H. doc. 792, 63d Cong. 2d sess.] 8vo..... | 1 | (a) | ..... |
| List of papers and documents not needed or useful in transaction of business nor of permanent value or historical interest. Mar. 2, 1914. [Printed as H. doc. 806, 63d Cong. 2d sess.] 8vo..... | 18 | (a) | ..... |
| Draft of proposed bill to authorize Secretary of Commerce to exchange rights of way in connection with lands pertaining to Lighthouse Service. Mar. 2, 1914. [Printed as H. doc. 807, 63d Cong. 2d sess.] 8vo..... | 1 | (a) | ..... |
| Estimate for construction of fireproof laboratory building for use in testing radio communication and to enable Bureau of Standards to provide space for experiments in radio communication by War and Navy and other Departments. Mar. 21, 1914. [Printed as H. doc. 849, 63d Cong. 2d sess.] 8vo..... | 4 | (a) | ..... |
| Estimate for completing establishment of light and fog-signal station on coasts of Kauai Island, Hawaii. Mar. 23, 1914. [Printed as H. doc. 855, 63d Cong. 2d sess.] 8vo..... | 2 | (a) | ..... |
| Letter submitting draft of bill to facilitate procurement of statistics of coast-wise trade of United States passing through Panama Canal. Apr. 25, 1914. [Printed as H. doc. 927, 63d Cong. 2d sess.] 8vo..... | 2 | (a) | 7.67 |
| Communication reporting claim for damages which has been considered, adjusted, and determined by Commissioner of Lighthouses in favor of Fleming Contracting Co., of New York. May 6, 1914. [Printed as H. doc. 966, 63d Cong. 2d sess.] 8vo..... | 2 | (a) | |
| Estimate of appropriation to enable Secretary of Commerce to employ such other persons as may be necessary to enforce laws prohibiting overcrowding of passenger and excursion vessels. May 29, 1914. [Printed as H. doc. 1003, 63d Cong. 2d sess.] 8vo..... | 2 | (a) | 16.51 |
| Draft of bill to authorize Secretary of Commerce to make partial payments for work done under public contracts and providing for lien on account of all payments made. June 12, 1914. [Printed as H. doc. 1033, 63d Cong. 2d sess.] 8vo..... | 2 | (a) | |

BUREAU OF THE CENSUS.

| | | | |
|---|-----|--------|-----------|
| Annual report of Director, 1913. 8vo..... | 31 | 2,000 | \$92.76 |
| Same [press summary]. oblong 4to..... | 1 | 1,600 | 13.80 |
| Official register of United States, persons in civil, military, and naval service, exclusive of Postal Service, 1913. [Biennial. Known as the Blue book.] 4to..... | 876 | 25 | 12,764.60 |
| NOTE.—Directory of employees of Federal Government; includes legislative, executive (exclusive of the Postal Service), and judicial branches. The publication of vol. 2, which heretofore contained a list of employees of Post Office Department and of Postal Service, has been discontinued in accordance with urgent deficiency act approved Oct. 22, 1913. This act also directs omission of list of ships and vessels belonging to United States previously published as part of the directory. | | | |
| Cotton production, 1912. 14 text fig. (Bulletin 116.) 4to..... | 63 | 42,000 | 1,844.85 |
| Same [reprint]..... | 63 | 5,000 | 151.36 |
| Same, 1913 [press summary]. oblong 4to..... | 1 | 8,000 | 17.16 |
| Supply and distribution of cotton, year ending Aug. 31, 1913. 5 text fig. (Bulletin 117.) 4to..... | 40 | 45,000 | 1,329.86 |
| Same [press summary]. 4to..... | 1 | 1,500 | 9.35 |
| Insane and feeble-minded in institutions, [calendar year] 1910, general tables. (Bulletin 119.) 4to..... | 99 | 1,000 | 1,424.78 |
| Same [reprint]..... | 99 | 5,000 | 453.70 |
| Paupers in almshouses, [calendar year] 1910, general tables. (Bulletin 120.) 4to..... | 99 | 1,000 | 1,453.06 |
| Same [reprint]..... | 99 | 5,000 | 461.22 |
| Prisoners and juvenile delinquents, [calendar year] 1910, general tables. (Bulletin 121.) 4to..... | 130 | 1,000 | 1,737.52 |
| Same [reprint]..... | 130 | 5,000 | 581.69 |

* None printed for the Department.

* List does not include publications of the Thirteenth Census.

PUBLICATIONS EMANATING FROM THE DEPARTMENT OF COMMERCE, FISCAL YEAR
ENDED JUNE 30, 1914, BY BUREAUS—Continued.

BUREAU OF THE CENSUS—Continued.

| Title and description. | Pages. | Edition. | Cost. |
|--|--------|----------|-----------|
| Estimates of population, 1910-14; [by Charles S. Sloane]. 1 text fig. (Bulletin 122.) 4to..... | 24 | 7,000 | \$458.57 |
| Telephones and telegraphs, [calendar year] 1912. (Bulletin 123.) 4to..... | 26 | 7,500 | 450.24 |
| Same [4 press summaries, 1 each for telephone, land telegraph, wireless telegraph, and ocean cable systems]. 4to..... | 4 | 7,425 | 52.96 |
| Central electric light and power stations and street and electric railways, [calendar year] 1912. (Bulletin 124.) 4to..... | 113 | 13,000 | 3,085.28 |
| Same [49 press summaries of report relating to central electric light and power stations, 1 for each State or group of States, continental United States, and municipal plants]. oblong 4to..... | 49 | 36,600 | 353.36 |
| Same [44 press summaries of report relating to electric railways, 1 for each State or group of States and continental United States]. oblong 4to..... | 44 | 34,150 | 341.16 |
| Bulletins 111-121 [title-page and contents]. 4to..... | 3 | 5,000 | 19.51 |
| Mortality statistics, [calendar year] 1909, 10th annual report. [Reprint.] 4to..... | 810 | 1,000 | 902.85 |
| Same, 1910, 11th annual report. 4to..... | 611 | 5,000 | 11,111.67 |
| Same, 1911, 12th annual report. 1 text fig. 4to..... | 572 | 5,000 | 9,213.33 |
| Same, 1911. 1 text fig. (Bulletin 112.) [Reprint.] 4to..... | 142 | 4,000 | 263.14 |
| Same, 1912, 13th annual report. 1 text fig. 4to..... | 382 | 5,000 | 7,480.85 |
| Same, 1912. [Reprint.]..... | 382 | 500 | 374.14 |
| Same, 1912 [press summary]. 4to..... | 1 | 1,500 | 8.34 |
| Religious bodies, 1906: pt. 1, Summary and general tables. 9 text fig. (Special reports.) [Reprint.] 4to..... | 576 | 500 | 516.41 |
| Same [reprint]..... | 576 | 800 | 787.59 |
| Religious bodies, 1906: pt. 2, Separate denominations; history, description, and statistics (Special reports.) [Reprint.] 4to..... | 670 | 300 | 461.09 |
| Same [reprint]..... | 670 | 1,000 | 845.43 |
| Religious bodies, 1906. 9 text fig. (Bulletin 108, 2d edition, revised and enlarged.) [Reprint.] 4to..... | 149 | 500 | 92.60 |
| General statistics of cities, 1909, including statistics of sewers and sewage disposal, refuse collection and disposal, street cleaning, dust prevention, highways and general highway service of cities having population of over 30,000. (Special reports.) 4to..... | 197 | 5,500 | 4,413.95 |
| Financial statistics of cities having population of over 30,000, 1911; [by] Le Grand Powers. 9 text fig. 1 map. (Special reports.) 4to..... | 401 | 5,500 | 7,593.63 |
| Same, 1912; [by] Le Grand Powers. 24 text fig. 1 map. 4to..... | 410 | 6,000 | 7,779.53 |
| Same, 1912; [by] Le Grand Powers. (Bulletin 118.) [Abridgment of final report for 1912.] 4to..... | 83 | 1,000 | 969.98 |
| Same [reprint]..... | 83 | 5,000 | 374.76 |
| Same [reprint]..... | 83 | 500 | 64.10 |
| Same, 1912 [press summary of report relating to cities under commission form of government]. oblong 4to..... | 1 | 5,000 | 15.71 |
| Same [press summary of report relating to salaries of city officials]. 4to..... | 1 | 2,000 | 4.33 |
| Same [press summary of report relating to schools]. 4to..... | 1 | 2,000 | 7.52 |
| Marriage and divorce, 1887-1906: pt. 1, Summary, laws, foreign statistics. 14 text fig. (Special reports.) [Reprint.] 4to..... | 549 | 500 | 502.10 |
| Same [reprint]..... | 549 | 500 | 468.71 |
| Marriage and divorce, 1887-1906: pt. 2, General tables. (Special reports.) [Reprint.] 4to..... | 850 | 300 | 553.81 |
| Same [reprint]..... | 850 | 700 | 814.71 |
| Marriage and divorce, 1887-1906; [by] Joseph A. Hill and Lewis Meriam]. (Bulletin 96, 2d edition, enlarged.) 14 text fig. 4to..... | 99 | 500 | 246.51 |
| Benevolent institutions, [calendar year] 1910; [by] Edwin M. Bliss]. 4to..... | 411 | 5,000 | 7,744.59 |
| Same [press summary]. oblong 4to..... | 1 | 2,300 | 11.75 |
| Manual of international list of causes of death based on 2d decennial revision by international commission, Paris, July 1-3, 1900. 1st reprint [with corrections and additions]. 8vo..... | 307 | 1,000 | 439.93 |
| Physicians' pocket reference to international list of causes of death. 2d edition. 1 text fig. narrow 24mo..... | 28 | 200,000 | 1,964.95 |
| Same [reprint]..... | 28 | 100,000 | 1,019.51 |
| Forest products: lumber, lath, and shingles, 1912. Dec. 30, 1913. 2 text fig. [Prepared in cooperation with Forest Service.] 8vo..... | 62 | 50,000 | 1,220.76 |
| Same [press summary]. 4to..... | 1 | 1,800 | 5.27 |
| Instructions to clerks and special agents, statistics of cities having population of over 30,000 [in] 1912, municipal finance. [Reprint] 1914 [with changes]. 16mo..... | 187 | 500 | 187.73 |
| Instructions to clerks and special agents, statistics of cities, towns, villages, and boroughs having 2,500 inhabitants or more, and of all counties and parishes, 1913, wealth, debt, and taxation. 16mo..... | 48 | 250 | 144.17 |
| Same [reprint with changes]..... | 48 | 750 | 45.91 |
| Instructions to special agents, cotton statistics. July 1, 1914. 12mo..... | 16 | 1,200 | 60.16 |
| Circular of information concerning tentative program of Bureau [1913-16]. Feb. 2, 1914. ([Circular] 1.) 8vo..... | 8 | 20,000 | 66.31 |
| Same [reprint]..... | 8 | 5,000 | 66.39 |
| Same [press summary]. oblong 4to..... | 1 | 1,000 | 9.31 |
| Circular of information concerning work of permanent Census Bureau, 1902-13. Mar. 1914. 3 text fig. ([Circular] 5.) 8vo..... | 31 | 5,000 | 186.01 |
| Same [reprint with changes]..... | 31 | 10,000 | 128.96 |

PUBLICATIONS EMANATING FROM THE DEPARTMENT OF COMMERCE, FISCAL YEAR
ENDED JUNE 30, 1914, BY BUREAUS—Continued.

BUREAU OF THE CENSUS—Continued.

| Title and description. | Pages. | Edition. | Cost. |
|---|--------|----------|------------|
| Ravages of boll weevil, circular of information showing decrease in cotton production due to ravages of boll weevil, as reflected by reports of cotton ginned. il. narrow 16mo..... | 12 | 300,000 | \$1,406.32 |
| Same [press summary]. 4to..... | 1 | 3,500 | 9.53 |
| Mother tongue of New York State [press summary]. 4to..... | 1 | 800 | 6.24 |
| Death rate of United States for 1913 [2 press summaries]. oblong 4to..... | 2 | 5,000 | 27.19 |
| Occupation statistics for United States [press summary]. oblong 4to..... | 1 | 4,000 | 12.15 |
| Workers in United States, by age and color and race [press summary]. oblong 4to..... | 1 | 3,000 | 8.92 |
| Wealth, debt, and taxation, 1913 [49 press summaries, 1 for each State and 1 reprint]. oblong 4to..... | 49 | 42,950 | 274.16 |

COAST AND GEODETIC SURVEY.

| | | | |
|---|-----|--------|----------|
| Annual report of Superintendent, 1913. 15 maps. [Printed also as H. doc. 400, 63d Cong. 2d sess.] 8vo..... | 102 | 1,800 | \$977.30 |
| Tide tables, [calendar] year 1913 [with list of references]. il. [Reprint.] large 8vo..... | 542 | 300 | 298.68 |
| Same, 1914. large 8vo..... | 542 | 1,400 | 4,505.55 |
| General tide tables, [calendar] year 1915 [with list of references]. il. large 8vo..... | 542 | 1,400 | 6,484.86 |
| Tide tables for Atlantic coast of United States, including Canada and West Indies; from Tide tables, [calendar year] 1913. il. [Reprint.] large 8vo..... | 181 | 400 | 105.17 |
| Same, 1914..... | 181 | 1,900 | 284.26 |
| Atlantic coast tide tables for eastern North America, [calendar] year 1915; from General tide tables [calendar year 1915]. il. large 8vo..... | 183 | 2,000 | 361.41 |
| Tide tables for Pacific coast of United States, with foreign ports in Pacific Ocean; from Tide tables, [calendar year] 1913. [Reprint.] large 8vo..... | 165 | 800 | 120.94 |
| Same, 1914..... | 165 | 12,000 | 886.21 |
| Pacific coast tide tables for western North America, eastern Asia, and many island groups, [calendar] year 1915; from General tide tables [calendar year 1915]. large 8vo..... | 167 | 12,000 | 955.21 |
| Results of magnetic observations made by Survey, July 1, 1911-Dec. 31, 1912; by R. L. Paris. 1 text fig. (Special publication 15.) large 8vo..... | 102 | 800 | 641.36 |
| Results of observations made at magnetic observatory at Cheltenham, Md., 1911-12; by Daniel L. Hazard. 8 charts. 4to..... | 98 | 700 | 1,236.92 |
| Same, Honolulu, Hawaii, 1911-12; by Daniel L. Hazard. 6 charts. 4to..... | 99 | 750 | 1,239.98 |
| Same, Vieques, P. R., 1911-12; by Daniel L. Hazard. 7 charts. 4to..... | 102 | 800 | 1,236.73 |
| Same, Sitka, Alaska, 1911-12; by Daniel L. Hazard. 15 charts. 4to..... | 100 | 775 | 1,318.44 |
| United States coast pilot, Atlantic coast: sec. D, Cape Henry to Key West; [compiled by Herbert C. Graves, assisted by E. Vance Miller and J. T. Watkins]. map. [This volume covers same territory formerly included in pt. 7, Chesapeake Bay entrance to Key West.] 8vo..... | 231 | 4,000 | 1,809.86 |
| Same: pt. 4, Point Judith to New York [supplement to 5th edition]. May 15, 1914. large 8vo..... | 10 | 700 | 37.69 |
| Inside route pilot, New York to Key West, 1913; [by Herbert C. Graves and W. E. Parker]. 2d edition. 8 maps in pocket. large 8vo..... | 66 | 3,000 | 731.43 |
| Determination of time, longitude, latitude, and azimuth; by William Bowie. 5th edition. 8 pl. 18 p. of pl. (Special publication 14.) [Reprint.] 4to..... | 177 | 1,000 | 272.56 |
| Triangulation along west coast of Florida; by Clarence H. Swick. 1 pl. 28 maps. (Special publication 16.) 4to..... | 147 | 1,300 | 1,678.55 |
| Triangulation on coast of Texas, from Sabine Pass to Corpus Christi Bay; by Charles A. Mourhees. 1 pl. 18 maps. (Special publication 17.) 4to..... | 89 | 1,300 | 1,083.96 |
| Fourth general adjustment of precise level net in United States and resulting standard elevations; by William Bowie and H. G. Avers. 4 pl. map. (Special publication 18.) 4to..... | 328 | 2,500 | 4,085.79 |
| Table of depths for channels and harbors, coasts of United States, including Porto Rico, Hawaiian Islands, and Philippine Islands. 4to..... | 175 | 2,000 | 1,767.66 |
| Summary of survey of oyster bars of Maryland, 1906-12 [carried on by Coast and Geodetic Survey in cooperation with Fisheries Bureau and Maryland Shell Fish Commission]; by C. C. Yates. 1 pl. 2 maps in pocket. large 8vo..... | 81 | 800 | 545.30 |
| Principal facts of the earth's magnetism and methods of determining true meridian and magnetic declination; [by L. A. Bauer]. 7 pl. 5 maps. [From United States magnetic declination tables and isogonic charts, 1902, with certain changes.] [Reprint.] large 8vo..... | 99 | 700 | 116.16 |

PUBLICATIONS EMANATING FROM THE DEPARTMENT OF COMMERCE, FISCAL YEAR
ENDED JUNE 30, 1914, BY BUREAUS—Continued.

BUREAU OF CORPORATIONS.

| Title and description. | Pages. | Edition. | Cost. |
|--|--------|----------|----------|
| Annual report of Commissioner, 1912. [Reprint.] 8vo..... | 24 | 200 | \$8.00 |
| Same, 1913. 8vo..... | 8 | 2,500 | 31.11 |
| Same, 1913 [press proofs]..... | *8 | 2,100 | 21.40 |
| Special report on taxation, supplementing previous reports on taxation of corporations and covering tax movement throughout United States during 1912. Dec. 1913. 8vo..... | 478 | 2,500 | 2,208.25 |
| Same [press proofs]..... | *4 | 2,100 | 13.90 |
| Special report on present and past conditions in lumber and shingle industry in State of Washington. Feb. 16, 1914. 11. 8vo..... | 43 | 1,000 | 119.87 |
| Lumber industry: pt. 1, Standing timber. Jan. 20, 1913. 2 maps. [Reprint.] 8vo..... | 325 | 750 | 149.58 |
| Same [reprint]..... | 325 | 740 | 155.94 |
| Same: pt. 4, Conditions in production and wholesale distribution, including wholesale prices. Apr. 21, 1914. [Press proofs of Letter of submittal.] 8vo..... | *5 | 1,800 | 19.07 |
| Taxation of corporations: pt. 1, New England, report on system of taxing mercantile, transportation, and transmission corporations in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut [with bibliographies]. May 17, 1900. [Reprint.] 8vo..... | 170 | 500 | 54.97 |
| Same: pt. 3, Eastern Central States (Ohio, Indiana, Illinois, Michigan, and Wisconsin). July 31, 1911. [Reprint.] 8vo..... | 119 | 500 | 44.54 |
| Report on steel industry: pt. 1, Organization, investment, profits, and position of United States Steel Corporation. July 1, 1911. 1 chart. [Reprint.] 8vo..... | 446 | 500 | 100.17 |
| Same: pt. 3, Cost of production, full report. May 6, 1913. [Reprint.] 8vo..... | 603 | 500 | 212.52 |
| Report on transportation by water in United States: pt. 3, Water terminals. Sept. 26, 1910. 1 pl. 18 maps. [Reprint.] 8vo..... | 458 | 500 | 342.43 |
| Same: pt. 4, Control of water carriers by railroads and by shipping consolidations. Dec. 23, 1912. 4 maps, 5 diag. [Reprint.] 8vo..... | 119 | 500 | 67.34 |
| Bureau publications available for distribution. Feb. 1, 1914. 8vo..... | 1 | 300 | 2.11 |

BUREAU OF FISHERIES.

| | | | |
|---|-----|-------|----------|
| Annual report of Commissioner, 1913. (B. F. doc. 782.) 8vo..... | 78 | 1,500 | \$347.15 |
| Same [reprint]..... | 78 | 500 | 27.31 |
| Report of Commissioner, 1911, and special papers. 4 pl. 10 p. of pl. 3 maps. 8vo..... | 501 | 250 | 324.77 |
| CONTENTS.—Report of Commissioner of Fisheries.—Effects of explosive sounds, such as those produced by motor boats and guns, upon fishes; by G. H. Parker.—Mussel fauna of Maumee River; by H. Walton Clark and Charles B. Wilson.—Mussel fauna of Kankakee Basin; by Charles B. Wilson and H. Walton Clark.—Mussels of Big Buffalo Fork of White River, Ark.; by B. E. Meek and H. Walton Clark.—Preliminary examination of halibut fishing grounds of Pacific coast, by A. B. Alexander; with introductory notes on halibut fishery, by H. B. Joyce.—Mussel resources of Holston and Clinch Rivers of eastern Tennessee, investigation by J. F. Boepple; by R. E. Coker.—Alaska fisheries and fur industries in 1911: General administrative report, by Barton Warren Evermann and F. M. Chamberlain; Statistics of fisheries of Alaska, 1911, by F. M. Chamberlain and John N. Cobb; Fish culture in Alaska, by Ward T. Bower; Fur-seal service in 1911, by Walter I. Lembkey.—Condition and extent of natural oyster beds and barren bottoms of Mississippi Sound, Ala.; by H. F. Moore.—Condition and extent of natural oyster beds and barren bottoms of Mississippi east of Biloxi; by H. F. Moore. | | | |
| Same, 1911 [title-page and contents only]. 8vo..... | 3 | 750 | 10.14 |
| Same, 1912, and special papers. 10 pl. 4 p. of pl. map. 8vo..... | 409 | 250 | 256.05 |
| CONTENTS.—Report of Commissioner of Fisheries.—Distribution of fish and fish eggs, fiscal year 1912.—Identification of glochidia of fresh-water mussels; by Thaddeus Surber.—Fishery and fur industries of Alaska in 1912: General administrative report, by Barton Warren Evermann; Fishery industries, by Fred. M. Chamberlain and Ward T. Bower; Fur-seal service, by Walter I. Lembkey; Minor fur industries, by Harry J. Christoffers and Lee R. Dice.—Mussels of Cumberland River and its tributaries; by Charles B. Wilson and H. Walton Clark.—Fishes and fishing in Sunapee Lake; by William Converse Kendall.—Protection of fresh-water mussels; by R. E. Coker. | | | |
| Distribution of fish and fish eggs, fiscal year 1913; [by] Robert S. Johnson. (B. F. doc. 794.) [App. 1, report of Commissioner, 1913.] 8vo..... | 124 | 2,000 | 1,082.44 |
| Fishes of streams tributary to Monterey Bay, Cal.; by John Otterbein Snyder. July 24, 1913. 4 pl. 2 maps. ([B. F.] doc. 776.) [From Bulletin, vol. 32.] large 8vo..... | 28 | 1,500 | 316.62 |
| Anatomy and histology of alimentary tract of king salmon; by Charles W. Greene. July 25, 1913. 4 pl. ([B. F.] doc. 777.) [From Bulletin, vol. 32.] large 8vo..... | 30 | 1,500 | 190.42 |

* Leaves.

PUBLICATIONS EMANATING FROM THE DEPARTMENT OF COMMERCE, FISCAL YEAR
ENDED JUNE 30, 1914, BY BUREAUS—Continued.

BUREAU OF FISHERIES—Continued.

| Title and description. | Pages. | Edition. | Cost. |
|---|--------|----------|----------|
| Notes on natural hosts of fresh-water mussels; by Thaddeus Surber. June 28, 1913. 3 pl. ([B. F.] doc. 778.) [From Bulletin, vol. 32.] large 8vo. | 18 | 1,500 | \$136.46 |
| Observations on fish scales; by T. D. A. Cockerell. Oct. 25, 1913. 9 pl. ([B. F.] doc. 779.) [From Bulletin, vol. 32.] large 8vo. | 60 | 1,500 | 599.33 |
| Fishery and fur industries of Alaska in 1912. (B. F. doc. 780.) 8vo. | 125 | 1,750 | 533.98 |
| CONTENTS.—General administrative report; by Barton Warren Evermann.—Fishery industries; by Fred. M. Chamberlain and Ward T. Bower.—Fur-seal service; by Walter I. Lembkey.—Minor fur industries; by Harry J. Christoffers and Lee R. Dice. | | | |
| Mussels of Cumberland River and its tributaries; by Charles B. Wilson and H. Walton Clark. (B. F. doc. 781.) 8vo. | 65 | 1,500 | 311.23 |
| Fishes and fishing in Sunapee Lake; by William Converse Kendall. 3 pl. map. (B. F. doc. 783.) 8vo. | 98 | 1,750 | 690.96 |
| New method for determination of food value of proteins, with application to Cynoscion regalis; by George F. White and Adrian Thomas. Feb. 18, 1914. 11. ([B. F.] doc. 784.) [From Bulletin, vol. 32.] large 8vo. | 7 | 1,750 | 38.82 |
| Properties of fish and vegetable oil mixtures; by George F. White and Adrian Thomas. Feb. 18, 1914. 11. ([B. F.] doc. 785.) [From Bulletin, vol. 32.] large 8vo. | 16 | 1,750 | 98.12 |
| Effect of water-gas tar on oysters; by Philip H. Mitchell. Feb. 18, 1914. ([B. F.] doc. 786.) [From Bulletin, vol. 32.] large 8vo. | 8 | 1,750 | 86.57 |
| Oxygen requirements of shellfish; by Philip H. Mitchell. Feb. 18, 1914. 11. ([B. F.] doc. 787.) [From Bulletin, vol. 32.] large 8vo. | 16 | 1,750 | 81.85 |
| Anthozoa of Woods Hole region [with list of literature cited]; by Charles W. Hargitt. Apr. 25, 1914. 4 pl. ([B. F.] doc. 788.) [From Bulletin, vol. 32.] large 8vo. | 33 | 1,750 | 401.55 |
| Cephalopoda of Hawaiian Islands [with bibliography]; by S. Stillman Berry. June 24, 1914. 11 pl. ([B. F.] doc. 789.) [From Bulletin, vol. 32.] large 8vo. | 109 | 1,750 | 1,056.14 |
| Carcinoma of thyroid in salmonoid fishes [investigation and experimental study conducted jointly by Gratwick Laboratory of State Institute for Study of Malignant Disease, Buffalo, N. Y., and Bureau of Fisheries, with bibliography]; by Harvey R. Gaylord and Millard C. Marsh [with collaboration of Frederick C. Busch and Burton T. Simpson]. Apr. 22, 1914. 54 pl. map. ([B. F.] doc. 790.) [From Bulletin, vol. 32.] large 8vo. | 163 | 1,750 | 2,079.43 |
| Protection of fresh-water mussels; by R. E. Coker. 2 p. of pl. (B. F. doc. 793.) 8vo. | 24 | 4,750 | 163.20 |
| Embryology and larval development of Bairdiella chrysura and Anchovia mitchilli; by Albert Kuntz. May 29, 1914. 11. ([B. F.] doc. 795.) [From Bulletin, vol. 33.] large 8vo. | 19 | 1,750 | 134.97 |
| List of publications of Bureau available for distribution. Aug. 15, 1913. (B. F. doc. 814.) 8vo. | 23 | 1,000 | 106.37 |
| Economic circulars [all 8vo]: | | | |
| 6. Mussel fisheries of Caddo Lake and Cypress and Sulphur Rivers of Texas and Louisiana; [by Austin F. Shira]. Dec. 10, 1913. | 10 | 500 | 31.62 |
| 7. Opportunity for new sea scallop fishery off middle Atlantic coast. Jan. 28, 1914. 11. | 5 | 1,000 | 19.65 |
| 8. Offshore fishing grounds of North Carolina; [by Lewis Radcliffe]. Feb. 25, 1914. 11. | 6 | 1,000 | 24.16 |
| 9. Mussel streams of eastern Oklahoma; [by F. B. Isely]. Feb. 17, 1914. 4. | 4 | 1,000 | 14.27 |
| 10. Mussel resources in Missouri. Feb. 27, 1914. | 6 | 1,000 | 14.81 |
| 11. Canned salmon, cheaper than meats, and why; including 50 tested recipes. Mar. 7, 1914. | 11 | 25,000 | 163.19 |
| 12. Sea mussels, what they are and how to cook them, with 18 recipes; [by Charles Doncot]. Mar. 24, 1914. 11. | 5 | 10,000 | 47.95 |
| Travel regulations [of Department of Commerce], with Bureau of Fisheries appendix, effective Aug. 1, 1913. 16mo. | 46 | 1,000 | 151.08 |
| Oyster industry of Pacific Coast States, 1912 [and Comparative statistics of oyster product of Pacific Coast States, 1880-1912]. (Statistical bulletin 289.) narrow fo. | 1 | 1,000 | 40.06 |
| Statement of quantities and values of certain fishery products landed at Boston and Gloucester, Mass., by American fishing vessels [issued monthly, June, 1913-May, 1914, 12 numbers, each 1 p. oblong large 8vo; statistical bulletins 291-294, 296-298, 301-304, 306]. | 12 | 3,100 | 371.07 |
| Menhaden industry of Atlantic Coast States in 1912. (Statistical bulletin 295.) large 4to. | 1 | 1,000 | 28.14 |
| Statement, by months, of quantities and values of certain fishery products landed at Boston and Gloucester, Mass., by American fishing vessels, [calendar] year 1913. (Statistical bulletin 296.) oblong large 8vo. | 1 | 500 | 23.05 |
| Statement, by fishing grounds, of quantities and values of certain fishery products landed at Boston and Gloucester, Mass., by American fishing vessels, [calendar] year 1913. (Statistical bulletin 300.) oblong large fo. | 1 | 500 | 50.13 |
| Fresh-water mussel fishery of streams tributary to Gulf of Mexico from Ohio River southward in 1912. (Statistical bulletin 305.) oblong large fo. | 1 | 1,800 | 40.69 |
| Artificial propagation of shad and pike perch. 9 pl. 5 text fig. [From Fish manual.] [Reprint.] 8vo. | 43 | 1,000 | 51.03 |

PUBLICATIONS EMANATING FROM THE DEPARTMENT OF COMMERCE, FISCAL YEAR
ENDED JUNE 30, 1914, BY BUREAUS—Continued.

BUREAU OF FISHERIES—Continued.

| Title and description. | Pages. | Edition. | Cost. |
|---|--------|----------|----------|
| Artificial propagation of Atlantic salmon, rainbow trout, and brook trout. 18 pl. 1 map, 14 text fig. [From Fish manual.] [Reprint.] 8vo..... | 76 | 1,000 | \$126.62 |
| Oysters and methods of oyster-culture, with notes on clam-culture; by H. F. Moore. 18 pl. 6 text fig. [From Fish manual.] [Reprint.] 8vo.... | 80 | 1,000 | 102.15 |
| Artificial propagation of black basses, crappies, and rock bass. 3 pl. 1 map, 3 text fig. [From Fish manual.] [Reprint.] 8vo..... | 19 | 1,000 | 35.89 |
| Artificial propagation of marine species. 10 pl. 1 text fig. [From Fish manual.] [Reprint.] 8vo..... | 46 | 1,000 | 81.72 |
| Artificial propagation of salmon of Pacific coast. 8 pl. [From Fish manual.] [Reprint.] 8vo..... | 17 | 1,000 | 56.02 |

BUREAU OF FOREIGN AND DOMESTIC COMMERCE.

| | | | |
|--|-------|-----------|-----------|
| Annual report of Chief, 1913. 8vo..... | 15 | 800 | \$37.70 |
| Daily consular and trade reports [issued daily except Sundays and legal holidays, July 1, 1912-June 30, 1914, 306 issues, 16-32 p. each.] 11. 8vo.... | 6,512 | 6,120,000 | 58,410.01 |
| Same, [title-page and index to] nos. 75-151 [series 1913]; Apr.-June, 1913. [Quarterly.] 8vo..... | 37 | 700 | 229.09 |
| Same, [title-page and index to] nos. 152-228 [series 1913]; July-Sept. 1913. [Quarterly.] 8vo..... | 34 | 700 | 210.15 |
| Same, [title-page and index to] nos. 229-305 [series 1913]; Oct.-Dec. 1913. [Quarterly.] 8vo..... | 34 | 700 | 222.26 |
| Same, [title-page and index to] nos. 1-75 [series 1914]; Jan.-Mar. 1914. [Quarterly.] 8vo..... | 36 | 700 | 312.21 |
| Foreign tariff notes, no. 10. [From Daily consular and trade reports, Jan.-June, 1913.] 8vo..... | 48 | 750 | 90.22 |
| Same, no. 11. [From Daily consular and trade reports, July-Dec. 1913.] 8vo..... | 40 | 750 | 86.62 |
| Same, no. 12. [From Daily consular and trade reports, Jan.-Mar. 1914.] 8vo..... | 32 | 850 | 41.22 |
| Foreign commerce and navigation of United States, year ending June 30, 1913. [Printed also as H. doc. 942, 63d Cong. 2d sess.] 4to..... | 903 | 1,300 | 16,391.88 |
| Separates reprinted from Foreign commerce and navigation, 1913 [all 4to]: Imports of merchandise, by articles and countries, 1909-13. [Table 3.] | 263 | 500 | 80.72 |
| Exports of domestic merchandise, by articles and countries, 1909-13. [Table 6.] | 382 | 600 | 129.82 |
| Imported merchandise entered for consumption in United States and duties collected thereon, 1913: Total values of imported merchandise entered for consumption, by customs districts and ports. [Tables 15-16.] | 89 | 750 | 95.22 |
| Statistical abstract of United States, 1913. no. 36. [Printed also as H. doc. 990, 63d Cong. 2d sess.] 8vo..... | 720 | 2,100 | 4,897.76 |
| Statistical record of progress of United States, 1800-1913, and monetary, commercial, and financial statistics of principal countries. Aug. 1913. [From Statistical abstract, 1913.] 8vo..... | 89 | 850 | 145.86 |
| Monthly summary of commerce and finance of United States [May, 1913-Apr. 1914, 12 numbers; printed also as H. doc. 938, pt. 11-12, 62d Cong. 3d sess., and H. doc. 305, pt. 1-10, 63d Cong. 2d sess.; all 4to]: May, 1913; no. 11, series 1912-13..... | 104 | 2,700 | 1,347.56 |
| June, 1913; no. 12, series 1912-13 [includes title-page and contents for vol. 20]..... | 130 | 2,700 | 1,791.58 |
| July, 1913; no. 1, series 1913-14..... | 106 | 2,700 | 1,157.97 |
| Aug. 1913; no. 2, series 1913-14..... | 106 | 2,700 | 1,136.95 |
| Sept. 1913; no. 3, series 1913-14..... | 106 | 2,800 | 1,141.19 |
| Oct. 1913; no. 4, series 1913-14..... | 100 | 2,800 | 1,059.67 |
| Nov. 1913; no. 5, series 1913-14..... | 92 | 2,800 | 1,011.05 |
| Dec. 1913; no. 6, series 1913-14..... | 94 | 2,800 | 1,085.91 |
| Jan. 1914; no. 7, series 1913-14..... | 92 | 2,900 | 1,031.30 |
| Feb. 1914; no. 8, series 1913-14..... | 92 | 2,900 | 1,008.39 |
| Mar. 1914; no. 9, series 1913-14..... | 92 | 2,900 | 953.21 |
| Apr. 1914; no. 10, series 1913-14..... | 92 | 2,950 | 970.37 |
| Advance sheets from Monthly summary of commerce and finance, showing details of imports and exports, by articles [June, 1913-Apr. 1914, 11 numbers, 32-63 p. each.] 4to..... | 530 | 7,475 | 6,423.17 |
| Total values of imports and exports of United States [issued monthly, June, 1913-May, 1914, except Dec. 1913, and Jan. 1914, 10 numbers, 2 p. each.] 4to..... | 20 | 8,125 | 144.62 |
| Exports of domestic breadstuffs, cottonseed oil, food animals, meat and dairy products, cotton, and mineral oils [issued monthly, June, 1913-May, 1914, 12 numbers, 4-13 p. each; bull. 12, series 1912-13, and 1-11, series 1913-14.] 4to..... | 98 | 13,100 | 1,289.80 |
| Imported merchandise entered for consumption in United States and duties collected thereon during quarters ending Sept. 30 and Dec. 31, 1912, and Mar. 31, 1913. 4to..... | 175 | 1,000 | 1,495.29 |
| Same, quarters ending Sept. 30 and Dec. 31, 1912, and Mar. 31 and June 30, 1913. 4to..... | 177 | 1,000 | 944.86 |

PUBLICATIONS EMANATING FROM THE DEPARTMENT OF COMMERCE, FISCAL YEAR
ENDED JUNE 30, 1914, BY BUREAUS—Continued.

BUREAU OF FOREIGN AND DOMESTIC COMMERCE—Continued.

| Title and description. | Pages. | Edition. | Cost. |
|--|--------|----------|----------|
| Imported merchandise entered for consumption in United States and duties collected thereon during quarter ending Sept. 30, 1913, including Oct. 1-3, under tariff of 1909. 4to..... | 68 | 1,000 | \$837.48 |
| Sailing dates of steamships from principal ports of United States to ports in foreign countries [issued monthly, Aug. 1913-July, 1914, 12 numbers, 17-21 l. each]. narrow fo..... | 238 | 645 | 912.18 |
| Special agents series [all 8vo]: | | | |
| 62. Utilization of atmospheric nitrogen [with bibliography]; by Thomas H. Norton. 1l. [Printed also as H. doc. 912, 63d Cong. 2d sess.] [Reprint.]..... | 178 | 100 | 87.48 |
| 67. Commerce and industries of Alaska, Hawaii, Porto Rico, and Philippine Islands; by A. G. Robinson. [Reprint.]..... | 116 | 500 | 36.12 |
| 72. Transportation rates to west coast of South America; by F. J. Sheridan..... | 99 | 700 | 771.67 |
| 73. Shoes and leather trade in Belgium, Spain, and Egypt; by Arthur B. Butman..... | 34 | 700 | 100.36 |
| 74. Linen, jute, and hemp industries in United Kingdom, with notes on growing and manufacture of jute in India; by W. A. Graham Clark. 1l..... | 172 | 750 | 756.28 |
| Same [reprint]..... | 172 | 250 | 47.82 |
| 75. Edible oils in Mediterranean district; by Erwin W. Thompson..... | 32 | 750 | 114.67 |
| 76. Commerce and industries of Canada and Newfoundland; by A. G. Robinson..... | 94 | 1,200 | 494.15 |
| 77. Production and use of denatured alcohol in principal countries; by Charles A. Crampton..... | 32 | 825 | 120.94 |
| 78. Commercial organizations in Germany [with bibliography]; by Archibald J. Wolfe..... | 170 | 1,000 | 582.67 |
| 79. Commercial organizations in southern and western cities; by George W. Doonan..... | 54 | 750 | 171.13 |
| Same [reprint]..... | 54 | 200 | 14.84 |
| 80. Cotton goods in British East Africa, Uganda, Zanzibar, and German East Africa; by Ralph M. Odell..... | 91 | 850 | 330.81 |
| Same [reprint]..... | 91 | 300 | 26.79 |
| 81. South America as an export field; by Otto Wilson. [Includes list of Bureau's publications on South America.]..... | 216 | 850 | 801.80 |
| 82. Cotton goods in Portuguese East Africa; by Ralph M. Odell..... | 35 | 850 | 120.25 |
| Same [reprint]..... | 35 | 300 | 12.83 |
| 83. Cotton goods in South Africa; by Ralph M. Odell..... | 60 | 850 | 205.18 |
| Same [reprint]..... | 60 | 300 | 18.18 |
| 84. Cottonseed products and their competitors in northern Europe: pt. 1, Cake and meal; by Erwin W. Thompson. 1l..... | 93 | 1,000 | 411.48 |
| Special consular reports [all 8vo]: | | | |
| 60. Foreign markets for railway supplies and equipment. 1l..... | 224 | 700 | 773.89 |
| 61. Russia, handbook on commercial and industrial conditions [with bibliography], by John H. Snodgrass and other consular officers; (and Foreign corporations in Russia, by C. J. Medzikhovsky). 2 maps..... | 255 | 750 | 981.93 |
| Same [reprint]..... | 255 | 300 | 121.99 |
| 62. Markets for American fruit..... | 54 | 750 | 169.82 |
| 63. Cooking and heating stoves in foreign countries..... | 63 | 850 | 189.83 |
| 64. Utilization of potatoes in Europe; by Robert P. Skinner and other consular officers..... | 44 | 850 | 167.36 |
| 65. Development of Dominican Republic; by Charles H. Albrecht and Frank Anderson Henry..... | 36 | 850 | 145.52 |
| Tariff series [all 8vo]: | | | |
| 15c. Supplement to [Customs] tariff of Italy. Aug. 1913. [Supplement to 15.]..... | 3 | 500 | 21.21 |
| 19a. Commercial travelers and samples in South America; [by Chauncey D. Snow]. Revised to Jan. 1, 1914. [Substitute for chapter relating to South America in 19.] 8vo..... | 12 | 750 | 35.73 |
| 27. Customs tariff of Cuba, revised to Nov. 1911; with introduction by Frank R. Rutter. [Reprint.]..... | 89 | 100 | 20.63 |
| 27b. Supplement to [Customs] tariff of Cuba. June, 1914. [Supplement to 27.]..... | 5 | 1,000 | 46.71 |
| 28a. Supplement to [Customs] tariff of Japan. Aug. 1913. [Supplement to 28.]..... | 2 | 1,000 | 17.16 |
| 29. Foreign import duties on office appliances, typewriters, typewriter ribbons, carbon paper, manifold apparatus, adding machines, and cash registers, revised to Apr. 1914; [by] Frank R. Rutter..... | 36 | 750 | 241.02 |
| Miscellaneous series [all 8vo]: | | | |
| 6c. Promotion of commerce, outline of service maintained by Bureau and other bureaus and offices of Government..... | 28 | 2,000 | 107.37 |
| 6d. Promotion of commerce, outline of service maintained by Bureau and other bureaus and offices of Government. 1l..... | 30 | 1,000 | 70.45 |
| 10. Foreign publications for advertising American goods, advertising rates, circulation, subscription price, etc..... | 236 | 500 | 980.50 |
| 12. Publications on South America, brief review of information available to manufacturers and exporters in bulletins issued by Bureau. Same [reprint with changes]..... | 11 | 1,000 | 12.46 |
| | 11 | 1,000 | 35.61 |

PUBLICATIONS EMANATING FROM THE DEPARTMENT OF COMMERCE, FISCAL YEAR
ENDED JUNE 30, 1914, BY BUREAUS—Continued.

BUREAU OF FOREIGN AND DOMESTIC COMMERCE—Continued.

| Title and description. | Pages. | Edition. | Cost. |
|---|--------|----------|------------|
| Miscellaneous series—Continued. | | | |
| 13. Trade directory of South America for promotion of American export trade. | 428 | 300 | \$1,946.77 |
| 14. Annual review of foreign commerce of United States, [fiscal year] 1913. 11. | 44 | 1,000 | 165.66 |
| 15. Trade of United States with the world, 1912-13. Imports and exports of merchandise into and from United States by countries and principal articles, years ending June 30, 1912-13. [Formerly issued as table 19 of Foreign commerce and navigation of United States.] | 133 | 1,000 | 1,183.51 |
| Confidential bulletins [all 8vo]: | | | |
| 20. Markets for lumber. | 10 | 700 | 31.76 |
| 21. Pumps for foreign farms. | 8 | 750 | 17.94 |
| 22. Market for American flour in Constantinople. | 5 | 400 | 12.75 |
| 23. Agricultural machinery in Sicily and north Africa. | 11 | 1,000 | 28.13 |
| 24. Bad effect of substitution of goods. | 3 | 2,000 | 9.93 |
| 25. Market for American coal in Constantinople. | 5 | 700 | 12.48 |
| 26. Market for iron and steel goods in India. | 5 | 1,000 | 16.40 |
| 27. Suggestions for increasing American trade in France. | 16 | 1,500 | 44.66 |
| Same [reprint]. | 16 | 300 | 4.27 |
| Schedule E, classification of merchandise, with rates of duty, and laws and regulations governing preparation of quarter-yearly statements of imports entered for consumption in United States; approved Oct. 4, 1913. 8vo. | 106 | 500 | 1,435.66 |
| Same [reprint with changes]. 8vo. | 106 | 500 | 37.02 |
| Same [reprint]. | 106 | 1,200 | 68.13 |
| Same [reprint]. | 106 | 3,000 | 123.74 |
| Schedule A, classification of imports and exports of foreign commodities and laws and regulations governing preparation of monthly statement of imports and exports of foreign commodities in commerce of United States; approved Oct. 4, 1913. 8vo. | 27 | 800 | 117.76 |
| Response to resolution, report of investigation into advance in price of bagging used in baling cotton, also into advance in price of ties used in banding or baling cotton; [by D. M. Barclay, assisted by W. A. Graham Clark]. Oct. 20, 1913. 20 p. of pl. [Printed as S. doc. 213, 63d Cong. 1st sess.] 8vo. | 62 | 100 | 3.72 |

BUREAU OF LIGHTHOUSES.

| | | | |
|--|-------|---------|----------|
| Annual report of Commissioner, 1913. 8vo. | 138 | 1,400 | \$659.40 |
| Same: pt. 2. Purchases made by private contract or in open market, with reasons for such method of purchase, fiscal year 1913. [Printed also as H. doc. 485, 63d Cong. 2d sess.] 8vo. | 30 | 50 | 235.53 |
| Notice to mariners [issued weekly, jointly with Coast and Geodetic Survey], July 4, 1913-June 26, 1914, nos. 27-52+1-26, 52 numbers. 8vo. | 1,446 | 188,075 | 7,552.57 |
| Notice to mariners [Pacific coast posters nos. 7-10, each 1 p.] fo. | 4 | 1,800 | 23.29 |
| Same [Atlantic coast posters nos. 11-21, each 1 p.] fo. | 11 | 10,850 | 84.00 |
| Lighthouse Service bulletin [issued monthly, July, 1913-June, 1914, nos. 19-30, 12 numbers, 4 p. each]. ff. 8vo. | 48 | 15,900 | 217.61 |
| Light list, Pacific coast, United States, Canada, Hawaiian, [Midway, Guam] and Samoan Islands. Corrected to Jan. 1, 1914. [Of the Samoan Islands only Tutuila is included in this publication.] 4to. | 109 | 3,000 | 1,389.40 |
| Same, Atlantic and Gulf coasts of United States. Corrected to Jan. 1, 1914. 4to. | 275 | 12,000 | 4,559.18 |
| Same, upper Mississippi River and tributaries. 13th lighthouse district. Corrected to July 15, 1913. narrow 16mo. | 255 | 1,250 | 829.90 |
| Same, Ohio, Tennessee, Kanawha, and Monongahela Rivers. 14th lighthouse district. Corrected to Sept. 15, 1913. narrow 16mo. | 135 | 1,000 | 573.29 |
| Same, lower Mississippi River and tributaries. 15th lighthouse district. Corrected to Nov. 15, 1913. narrow 16mo. | 103 | 1,000 | 345.59 |
| Atlantic coast of United States, buoy list, Maine and New Hampshire. 1st lighthouse district. Corrected to Jan. 1, 1914. 4to. | 61 | 6,000 | 1,157.80 |
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| Bureau of Lighthouses [organization of] and Law pertaining to Bureau and Lighthouse Service. [From Department of Commerce, condensed history, duties, etc., p. 127-142.] 8vo..... | 17 | 100 | 5.13 |

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| Seagoing vessels of United States, with official numbers and signal letters, 1913; pt. 6 of 45th annual list of merchant vessels of United States, year ended June 30, 1913. 1 pl. 4to..... | 128 | 5,000 | 1,092.13 |
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* Leaves.

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| 43. Metriccarat. 1st edition. Nov. 1, 1913. | 12 | 1,000 | 77.83 |
| 44. Polarimetry [and polarimetric analyses of raw and other sugars]. 1st edition. Jan. 15, 1914. 2 pl. 9 text fig. [Supersedes Circular 12]. | 140 | 1,500 | 883.60 |
| 45. Testing of materials. 1st edition. Nov. 1, 1913. | 80 | 1,500 | 391.68 |
| 46. Testing of barometers. 1st edition. Feb. 1, 1914. | 12 | 500 | 48.82 |
| Supplement to Circular 24, Publications of Bureau. Mar. 1, 1914. large 8vo. | 5 | 9,000 | 58.97 |
| Master scales for graduation of hydrometers. (Supplement to Circular 19.) large 8vo. | 9 | 500 | 95.90 |
| Preliminary report of joint rubber insulation committee. Oct. 1, 1913. (Supplement to Circular 38.) large 8vo. | 16 | 150 | 36.86 |
| Standard analyzed samples issued or in preparation. [Insert to accompany Circular 25.] large 8vo. | 4 | 1,500 | 40.25 |
| Same [reprint with changes]. | 5 | 1,000 | 43.05 |
| Standard samples, ordering and shipping regulations. (Extract from Circular 25.) 4to. | 1 | 1,500 | 6.20 |
| Technologic papers [all large 8vo]: | | | |
| 2. Strength of reinforced concrete beams, results of tests of 333 beams, 1st series; by Richard L. Humphrey and Louis H. Losse. June 27, 1911. 6 pl. 8 p. of pl. 9 tab. [Reprint]. | 202 | 1,000 | 274.94 |
| 3. Tests of absorptive and permeable properties of Portland cement mortars and concretes with tests of damp-proofing and waterproofing compounds and materials; by Rudolph J. Wig and P. H. Bates. Aug. 22, 1911. 6 pl. 64 text fig. [Reprint]. | 127 | 1,000 | 155.80 |
| Same [reprint]. | 127 | 500 | 100.78 |
| 4. Effect of added fatty and other oils upon carbonization of mineral lubricating oils; by C. E. Waters. Aug. 24, 1911. [Reprint]. | 14 | 1,000 | 19.91 |
| 6. Determination of chromium, and its separation from vanadium, in steels; by J. R. Cain. Nov. 1, 1911. [Reprint]. | 6 | 500 | 9.10 |
| 7. Testing of clay refractories, with special reference to their load carrying capacity at furnace temperatures; by A. V. Bleisner and G. H. Brown. Dec. 15, 1911. 30 text fig. [Reprint]. | 78 | 1,000 | 86.70 |
| 8. Rapid method for determination of vanadium in steels, ores, etc., based on its quantitative inclusion by phosphomolybdate precipitate; by J. R. Cain and J. C. Hostetter. Oct. 26, 1911. 2 text fig. [Reprint]. | 20 | 500 | 17.60 |
| 10. Melting points of fire bricks; by C. W. Kanolt. June 15, 1912. 1 pl. 3 text fig. [Reprint]. | 17 | 1,000 | 31.36 |
| 11. Comparison of 5 methods used to measure hardness; by Ralph P. Davies. July 22, 1912. 1 pl. 11 text fig. [Reprint]. | 27 | 500 | 28.11 |
| 12. Action of salts on alkali water and sea water on cements [with bibliography]; by P. H. Bates, A. J. Phillips, and Rudolph J. Wig. Nov. 1, 1912. 8 pl. 45 text fig. [Reprint]. | 157 | 500 | 129.27 |

PUBLICATIONS EMANATING FROM THE DEPARTMENT OF COMMERCE, FISCAL YEAR
ENDED JUNE 30, 1914, BY BUREAUS—Continued.

BUREAU OF STANDARDS—Continued.

| Title and description. | Pages. | Edition. | Cost. |
|---|--------|----------|----------|
| Technologic papers—Continued. | | | |
| 15. Surface insulation of pipes as means of preventing electrolysis; by Burton McCollum and O. S. Peters [with experience and opinions of pipe owning companies with regard to prevention of electrolysis and soil corrosion by means of insulating coatings]. Jan. 5, 1914. 3 pl. 2 text fig. | 44 | 2,500 | \$303.05 |
| 16. Manufacture of lime; by Warren E. Emley. Feb. 1913. 13 pl. 8 text fig. | 130 | 1,000 | 703.54 |
| 17. Function of time in vitrification of clays; by G. H. Brown and G. A. Murray. May 20, 1913. 1 pl. 19 text fig. | 26 | 500 | 180.00 |
| Same [reprint]. | 26 | 500 | 30.67 |
| 18. Electrolysis in concrete [with bibliography]; by E. B. Rosa, Burton McCollum, and O. S. Peters. Mar. 19, 1913. 9 pl. 24 text fig. | 127 | 2,500 | 881.80 |
| 19. Physical testing of cotton yarns; by Walter S. Lewis. Apr. 1, 1913. 1 text fig. | 31 | 500 | 192.55 |
| Same [reprint]. | 31 | 500 | 23.87 |
| 20. Determination of sulphur in illuminating gas; by R. S. McBride and E. R. Weaver. Mar. 7, 1913. 14 text figs. | 46 | 1,000 | 271.12 |
| 21. Dehydration of clays; by G. H. Brown and E. T. Montgomery. Apr. 25, 1913. 9 text fig. | 23 | 1,000 | 131.41 |
| 22. Effect of overfiring upon structure of clays; by A. V. Bleiinger and E. T. Montgomery. May 15, 1913. 8 text fig. | 23 | 1,000 | 180.87 |
| 23. Technical control of colloidal matter of clays; by H. E. Ashley [edited by John Johnston]. Nov. 1911. 8 pl. 6 text fig. | 118 | 750 | 628.70 |
| 24. Determination of phosphorus in steels containing vanadium; by J. R. Cain and F. H. Tucker. May 17, 1913. [Reprint.] | 11 | 500 | 13.14 |
| 25. Electrolytic corrosion of iron in soils; by Burton McCollum and K. H. Logan. June 12, 1913. 10 text fig. | 69 | 1,000 | 367.90 |
| Same [reprint with changes]. | 69 | 500 | 63.96 |
| 27. Special studies in electrolysis mitigation: 1, Preliminary study of conditions in Springfield, Ohio, with recommendations for mitigation; by E. B. Rosa and Burton McCollum. June 19, 1913. 6 text fig. 3 maps. | 55 | 1,000 | 292.49 |
| Same [reprint with changes]. | 55 | 500 | 56.96 |
| 29. Variations in results of sieving with standard cement sieves; by Rudolph J. Wig and J. C. Pearson. Aug. 1, 1913. 1 text fig. | 16 | 1,000 | 88.00 |
| 30. Viscosity of porcelain bodies; by A. V. Bleiinger and Paul Teeter. Nov. 20, 1913. 5 text fig. | 11 | 1,000 | 78.07 |
| 31. Some leadless borosilicate glazes maturing at about 1100° C.; by E. T. Montgomery. Dec. 15, 1913. 1 text fig. | 22 | 1,000 | 110.13 |
| 32. Special studies in electrolysis mitigation: 2, Electrolysis from electric railway currents and its prevention, experimental test on system of insulated negative feeders in St. Louis; by E. B. Rosa, Burton McCollum, and K. H. Logan. Dec. 27, 1913. 2 maps. | 34 | 1,000 | 304.40 |
| 33. Determination of carbon in steel and iron by barium carbonate titration method; by J. R. Cain. Jan. 31, 1914. 1 text fig. | 12 | 1,000 | 56.71 |
| 34. Determination of ammonia in illuminating gas; by J. D. Edwards. Mar. 2, 1914. 6 text fig. | 23 | 1,000 | 112.55 |
| 35. Combustion method for direct determination of rubber; by L. G. Wesson. Feb. 13, 1914. 1 text fig. | 11 | 1,000 | 58.50 |
| Tables of equivalents of United States customary and metric weights and measures. 4th edition. Jan. 31, 1913. [Reprint.] 4to. | 46 | 1,000 | 151.27 |
| International metric system of weights and measures. 6 text fig. [Reprint.] large 8vo. | 15 | 1,000 | 30.91 |
| Same [reprint]. | 15 | 1,000 | 19.99 |

STEAMBOAT-INSPECTION SERVICE.

| | | | |
|--|-----|---------|----------|
| Annual report of Supervising Inspector General, 1913. 8vo. | 42 | 1,000 | \$240.00 |
| List of officers of merchant steam, motor, and sail vessels licensed during year ended June 30, 1913. 8vo. | 270 | 1,000 | 2,205.07 |
| Laws governing Service, Revised Statutes as modified by acts of Congress. Edition, Apr. 15, 1913. 8vo. | 63 | 10,000 | 214.38 |
| Same [reprint]. | 63 | 20,000 | 424.39 |
| General rules and regulations prescribed by board of supervising inspectors, amended Jan. 1913, further amended Apr. 18, July 9, Aug. 16, Oct. 21, and Dec. 10, 1913. Edition, Jan. 13, 1914. 7 text fig. 8vo. | 145 | 25,000 | 1,215.63 |
| Amendments of steamboat-inspection rules and regulations. Oct. 25, 1913. 8vo. | 2 | 4,500 | 12.67 |
| Pilot rules for certain inland waters of Atlantic and Pacific coasts and coast of Gulf of Mexico. Edition, July 1, 1913. 5 text fig. [Reprint.] 8vo. | 29 | 50,000 | 598.41 |
| Same. Edition, Apr. 28, 1914. 8vo. | 30 | 135,000 | 1,692.14 |
| Insert to pilot rules for inland waters of Atlantic and Pacific coasts and coast of Gulf of Mexico [concerning lights for barges and canal boats in tow of steam vessels, effective on and after July 28, 1913]. 8vo. | 3 | 200,000 | 311.01 |

PUBLICATIONS EMANATING FROM THE DEPARTMENT OF COMMERCE, FISCAL YEAR
ENDED JUNE 30, 1914, BY BUREAUS—Continued.

STEAMBOAT-INSPECTION SERVICE—Continued.

| Title and description. | Pages. | Edition. | Cost. |
|--|--------|----------|---------|
| Pilot rules for rivers whose waters flow into Gulf of Mexico and their tributaries and Red River of the North. Edition, Aug. 1, 1911. 5 text fig. [Reprint.] 8vo..... | 22 | 3,000 | \$26.22 |
| Same [reprint]..... | 22 | 5,000 | 75.23 |
| Same [reprint]..... | 22 | 5,000 | 57.23 |
| Pilot rules for Great Lakes and their connecting and tributary waters [as far east as Montreal]. Edition, May 1, 1912. 5 text fig. [Reprint with slight changes.] 8vo..... | 20 | 3,000 | 47.32 |
| Same [reprint]..... | 20 | 5,000 | 58.57 |
| Same [reprint]..... | 20 | 5,000 | 53.07 |
| Same [reprint]..... | 20 | 5,000 | 53.57 |

There are represented in the foregoing table a total of 1,054 publications, against 843 for the same bureaus and offices in the fiscal year 1913. Fifty-three of those, against 23 in 1913, were printed in two or more editions during the year, while 110, compared with 73 last year, were reprints, without change, of issues of earlier years. The publications listed contain a total of 54,768 printed pages, compared with 41,507 in 1913, and there were issued of them for the Department a grand total of 8,586,605 copies, against 7,286,930 in the preceding year, an increase of 1,299,675 copies.

The following recapitulation of the table, together with summary figures for 1913, is submitted for comparative purposes:

| Bureau or office. | Publications. | | Pages. | | Copies printed for Department. ^a | | Cost. ^b | |
|---|---------------|-------|--------|--------|---|-----------|--------------------|------------|
| | 1913 | 1914 | 1913 | 1914 | 1913 | 1914 | 1913 | 1914 |
| Office of the Secretary.... | 50 | 56 | 2,560 | 2,090 | 92,850 | 197,050 | \$8,040.47 | \$6,435.72 |
| Bureau of the Census..... | 30 | 198 | 2,247 | 12,976 | 191,700 | 1,056,950 | 48,766.20 | 98,306.41 |
| Coast and Geodetic Survey..... | 25 | 25 | 2,070 | 4,674 | 31,500 | 55,125 | 16,561.04 | 32,782.06 |
| Bureau of Corporations.... | 19 | 15 | 3,964 | 3,136 | 33,225 | 16,990 | 14,553.78 | 3,672.45 |
| Bureau of Fisheries..... | 49 | 53 | 2,516 | 2,516 | 44,225 | 90,100 | 12,494.91 | 10,496.77 |
| Bureau of Foreign and Domestic Commerce.... | 428 | 425 | 16,343 | 16,220 | 6,264,435 | 6,242,470 | 135,270.79 | 121,820.68 |
| Bureau of Lighthouses.... | 105 | 108 | 3,147 | 3,432 | 256,665 | 279,020 | 22,087.51 | 25,791.17 |
| Bureau of Navigation..... | 16 | 19 | 2,239 | 2,036 | 74,600 | 42,100 | 10,998.50 | 11,817.41 |
| Bureau of Standards..... | 108 | 146 | 5,272 | 6,895 | 86,700 | 129,300 | 12,857.91 | 19,553.30 |
| Steamboat-Inspection Service..... | 13 | 10 | 1,159 | 793 | 211,000 | 477,500 | 6,511.71 | 7,295.61 |
| Total..... | 843 | 1,054 | 41,507 | 54,768 | 7,286,930 | 8,586,605 | 288,142.82 | 337,971.60 |

^a Includes all publications issued, whether for official use or for distribution to the public.

^b Figures relate to publications actually becoming available during the year for distribution; consequently they do not agree with similar figures in a preceding table giving the cost of work done by the Government Printing Office during the fiscal year. Frequently the cost of a publication is charged against allotments for two or more fiscal years.

An analysis of the above table shows gratifying results of the Division's efforts to obtain the maximum output for the minimum expenditure. While the number of copies printed increased 17.84 per cent and the number of pages increased 31.95 per cent, the increase in cost was only 17.29 per cent. The average edition of the publications in 1914 was 8,147 copies, against 8,644 in 1913; the average number of pages in the 1914 publications was 52, compared with 49 for those of 1913.

DISTRIBUTION OF PUBLICATIONS.

During the year 7,035,029 publications and printed circulars of the Department were distributed to the public, as compared with a total of 7,107,199 during the fiscal year 1913, a decrease of 72,170. This decrease was due to two causes—(1) revisions of mailing lists, which resulted in the removal of a large number of names, and (2) an extension of the Department's policy to curtail the promiscuous free distribution of its publications. Of the total number of publications and circulars distributed, 6,803,123 were wrapped and mailed by the office of the Superintendent of Documents and 231,906 by the Division of Publications. Those wrapped and mailed by the Superintendent of Documents comprised a mailing-list distribution of 6,507,834 and a distribution in response to individual requests of 295,289.

During the year the Department received and acted on 85,170 miscellaneous requests, calling for 484,331 copies of publications. This was an average of 278 requests and nearly 1,600 publications for each working day.

The number of publications distributed each month is shown in the following table:

| Month. | Mailed by Divi- sion. | Mailed by Supt. Docs. | Total. | Month. | Mailed by Divi- sion. | Mailed by Supt. Docs. | Total. |
|----------------|--------------------------|--------------------------|---------|---------------|--------------------------|--------------------------|-----------|
| July..... | 10,902 | 556,887 | 567,789 | February..... | 6,544 | 582,883 | 589,427 |
| August..... | 68,471 | 552,623 | 621,094 | March..... | 30,069 | 565,862 | 595,931 |
| September..... | 8,206 | 560,167 | 568,373 | April..... | 26,505 | 576,995 | 603,500 |
| October..... | 6,090 | 584,667 | 590,747 | May..... | 11,944 | 575,771 | 587,715 |
| November..... | 11,638 | 554,086 | 565,724 | June..... | 18,411 | 561,885 | 580,296 |
| December..... | 10,770 | 568,725 | 579,495 | | | | |
| January..... | 22,266 | 562,582 | 584,848 | Total..... | 231,906 | 6,803,123 | 7,035,029 |

The distribution of publications by bureaus and offices of issue is given in the following table:

| Bureau or office. | Mailed by Division. | Mailed by Supt. Docs. | Total. |
|--|------------------------|--------------------------|-----------|
| Office of the Secretary..... | 114,289 | 9,329 | 123,618 |
| Bureau of the Census..... | 106 | 24,156 | 24,262 |
| Coast and Geodetic Survey..... | 845 | 18,328 | 19,173 |
| Bureau of Corporations..... | 236 | 9,514 | 9,750 |
| Bureau of Fisheries..... | 37,097 | 37,498 | 74,595 |
| Bureau of Foreign and Domestic Commerce..... | 7,044 | 6,349,408 | 6,356,452 |
| Bureau of Lighthouses..... | 15,119 | 247,174 | 262,293 |
| Bureau of Navigation..... | 45,557 | 27,556 | 73,113 |
| Bureau of Standards..... | 3,893 | 79,024 | 82,917 |
| Steamboat-Inspection Service..... | 8,271 | 1,079 | 9,350 |
| Total..... | 231,906 | 6,803,123 | 7,035,029 |

* See note to table on next page.

A summary of the publications in stock July 1, 1913, the number received during the year, the number distributed during the year, and the number on hand July 1, 1914, by bureaus and offices of issue, follows.

| Bureau or office,* | In stock July 1, 1913. | Received during year. | Total. | Distrib- uted dur- ing year. | In stock July 1, 1914. |
|--|------------------------------|-----------------------------|-----------|------------------------------------|------------------------------|
| Office of the Secretary..... | 7,558 | 130,128 | 137,686 | 123,568 | 14,118 |
| Coast and Geodetic Survey..... | 41,295 | 19,554 | 60,849 | 18,673 | 42,176 |
| Bureau of Corporations..... | 7,917 | 11,182 | 19,099 | 9,750 | 9,349 |
| Bureau of Fisheries..... | 98,031 | 88,118 | 186,149 | 74,595 | 111,554 |
| Bureau of Foreign and Domestic Commerce. | 50,617 | 6,349,335 | 6,399,952 | 6,356,512 | 43,440 |
| Bureau of Lighthouses..... | 24,539 | 260,554 | 285,393 | 262,203 | 23,100 |
| Bureau of Navigation..... | 7,161 | 74,225 | 81,386 | 73,143 | 8,243 |
| Bureau of Standards..... | 102,418 | 70,205 | 172,623 | 82,884 | 89,739 |
| Steamboat-Inspection Service..... | 169 | 10,202 | 10,371 | 9,350 | 1,021 |
| Total..... | 340,005 | 7,013,503 | 7,353,508 | 6,701,768 | 842,740 |

* The Bureau of the Census has charge of the distribution of its own publications, which accounts for the omission of statistics for that Bureau from this table. The Division of Publications had charge of that work, however, for a part of the year, during which time 24,261 publications were sent out.

The foregoing statements do not include large quantities of publications printed for the official use of the various bureaus, offices, and services of the Department, which accounts for the receipts being smaller than the number of publications actually issued for the Department, as shown by the table on preceding pages of this report.

In its report for last year the Division explained the operation of section 8 of the act approved August 23, 1912, and suggested a modification of the section which would remove the requirement that franks for publications sent out in response to miscellaneous requests be forwarded to the office of the Superintendent of Documents and permit such requests to be acted upon by the Department. It is gratifying to be able to report that the printing bill now on the Calendars of the two Houses of Congress, with a prospect of being passed within the next few weeks, contains a provision which will accomplish this desirable change in the law.

MAILING LISTS.

During the year it was discovered that there was a wide discrepancy between the mailing lists maintained by the Department and the stencils for such lists kept by the Superintendent of Documents. Following this discovery, the Division obtained from the Superintendent of Documents lists printed from the stencils in his office and these lists were compared, name by name, with the card lists in the Division. The work was considerable, as 119 lists, containing 111,368 names (the figures including several lists the stencils for which are maintained in the Division), were involved.

During the year the Division revised also several of its mailing lists by circularizing parties thereon with a view to obtaining permission to remove from the lists the names of persons who no longer desired the publications they were listed to receive. The results reached have convinced the Division that there should be a complete revision of every mailing list at least once each year. It has not been possible heretofore to revise the lists that often, on account of lack of force, but the saving in both printing and distribution costs would undoubtedly justify the employment of a clerk to devote his entire time to this work. As an illustration, one case which came up during the year may be cited. The mailing list for the annual report of one of

the bureaus contained the names of 921 persons, to each of whom a multigraphed letter was sent, in which was inclosed a return card for the recipient to indicate whether or not he desired to continue to receive the report. Of the 921 cards sent out, 674 were returned, and of these 144 requested that their names be removed from the list and 530 expressed a desire to have their names remain on the list, leaving 247 from whom there has as yet been no response. Most of the latter will, however, probably be dropped from the list, as they have been notified that failure to respond to the Department's inquiry will be construed as a willingness to have their names removed. Of the 530 who expressed a desire to remain on the list, 133, or 25 per cent, requested that changes be made in their addresses. Also, in compliance with the request of the Department, 136 copies of the report, having served their purpose and being no longer desired by the recipients, were returned to the Department for subsequent redistribution. In view of the fact that the edition of the report was not sufficient to meet the demand, the Department, by the return of the 136 copies, was saved the expense of a reprint.

The revision of a mailing list involves not only the circularizing of names on the list and removals from both the mailing list proper and the general index to mailing lists, but also a vast amount of work in checking up changes of addresses, as well as the rewriting and rearranging of stencils where stencil lists are maintained. The advantage, however, of having the lists up to date and the economy that would result from retaining copies of publications which would otherwise be undelivered or sent to persons who do not really desire them justify the work incident to frequent revisions.

As a result of the revisions described above and the extension of the Department's policy to restrict the gratuitous distribution of its publications there were at the end of the year only 96,720 names on the mailing lists of the Division, a decrease during the year of about 15,000 names, although there were added 25 new lists (containing approximately 5,000 names), bringing the total number of lists up to 141.

SALES OF PUBLICATIONS.

Considerable progress was made during the year in placing the Department's publications on a sales basis, so far as practicable, and limiting free distribution to well-defined and well-selected public or quasi-public classes.

The free distribution of practically all publications of the Bureau of Foreign and Domestic Commerce is now confined to libraries, educational institutions, the press, and commercial or other organizations. Editions of the Bureau's publications have been considerably reduced, and individuals requesting copies are referred to the Superintendent of Documents, who maintains an ample stock for sale at nominal prices, based on the cost of printing from stereotype plates. The exploitation of new publications in Daily Consular and Trade Reports and through notices sent to newspapers and periodicals has created a demand for this Bureau's publications from sources heretofore not reached and has afforded a wider and more judicious circulation of many publications than would have been possible from the limited editions printed for the Department.

Beginning July 1, 1914, the free distribution of Daily Consular and Trade Reports, except to commercial organizations, newspapers, libraries, and colleges was discontinued, and to others the Superintendent of Documents now furnishes the Daily on a regular subscription basis, the price being fixed at \$2.50 per annum. Other publications of the Bureau being sold either on a subscription basis or at a flat rate include the Monthly Summary of the Foreign Commerce of the United States, Quarterly Statement of Imported Merchandise Entered for Consumption, Statistical Abstract of the United States, Annual Report on Commerce and Navigation of the United States, Commercial Relations of the United States with Foreign Countries, reports of special agents sent abroad to investigate trade conditions with respect to selected industries, and special reports of consular officers on assigned subjects.

The Bulletin of the Bureau of Standards (issued four times a year) is now sold by the Superintendent of Documents at 25 cents per number, or \$1 for the four numbers constituting a volume. The Department edition has, in consequence, been reduced from 2,500 to 1,500 copies. Undoubtedly the sales plan can be extended to other publications of this Bureau without depriving persons who have practical use for them.

It is believed that the present free distribution of large and expensive editions of the light lists and buoy books of the Bureau of Lighthouses could also be curtailed without detriment to the interests served. Other governments put a price on similar publications issued by them, and the justice of such a practice seems unquestionable. There is, however, some difficulty in arriving at a practical plan for the distribution. Tide Tables, Coast Pilots, and Charts, which have for many years been issued and sold by the Coast and Geodetic Survey, may be conveniently purchased by mariners at agencies established at all important ports on the seacoasts and the Great Lakes. The publications of the Bureau of Lighthouses should, of course, be procurable with equal facility, but it is doubtful if the Superintendent of Documents at present has authority for establishing the necessary number of agencies and supplying them with stock. Some specific legislation may therefore be necessary before the sales plan can be adopted for these publications.

In its efforts to promote the sale of publications the Division has had the active and cordial cooperation of the Superintendent of Documents and the bureaus concerned. The results have been so gratifying that further gradual extensions of the sales plan is recommended, as it is believed to furnish the most equitable and economical distribution of the Department's many publications. Experience has demonstrated that persons are willing to pay the merely nominal prices placed on the publications by the Superintendent of Documents, and when distributed under this plan the Department has a reliable method for judging the public demand for its publications and knows that they are reaching persons who have a real interest in them.

The principle of thus distributing publications is recognized by section 68 of the bill to revise the printing laws, now on the Senate and House Calendars, which proposes a valuation plan for the distribution of public documents by Members of Congress. This bill is the result of long and careful study by committees of Congress and is

designed especially to reduce the waste in public printing, which has frequently been the subject of much just criticism. The bill also authorizes the Superintendent of Documents to circulate free of charge an unlimited edition of the Monthly Catalogue of Government Publications, which will no doubt create a wider demand and afford still greater usefulness for the Department's publications. Such a demand should be met without making undue increases in charges against the Department's printing allotment.

Sales by the Superintendent of Documents during each of the past five years of publications issued by the Department is summarized in the following statement. This statement gives, by bureaus and offices of the Department, the total number of copies of publications sold and the total receipts from such sales. Details relating to the title, number of copies, and price of each publication sold appear in the annual reports of the Superintendent of Documents, from which the statement was compiled. The number of copies shown in the table does not in any case include distribution of publications to regular subscribers.

| Bureau, office, or service. | 1910 | | 1911 | | 1912 | | 1913 | | 1914 | |
|--|----------|------------|----------|------------|----------|------------|----------|------------|----------|------------|
| | Cop-ies. | Re-ceipts. | Cop-ies. | Re-ceipts. | Cop-ies. | Re-ceipts. | Cop-ies. | Re-ceipts. | Cop-ies. | Re-ceipts. |
| Office of the Secretary. | 61 | \$11.35 | 87 | \$19.35 | 58 | \$16.65 | 41 | \$11.35 | 45 | \$12.90 |
| Bureau of the Census.. | 814 | 547.25 | 1,174 | 569.95 | 5,595 | 1,039.15 | 2,444 | 948.15 | 2,130 | 887.75 |
| Coast and Geodetic Survey..... | 101 | 81.65 | 141 | 95.60 | 159 | 134.15 | 159 | 123.30 | 205 | 127.65 |
| Bureau of Corporations..... | 171 | 76.40 | 162 | 68.85 | 704 | 254.75 | 825 | 308.30 | 912 | 376.90 |
| Bureau of Fisheries.... | 325 | 181.15 | 473 | 244.95 | 469 | 287.65 | 406 | 301.00 | 13,599 | 448.30 |
| Bureau of Foreign and Domestic Commerce ^b | 5,415 | 526.65 | 6,922 | 13,883.20 | 22,506 | 6,688.10 | 5,448 | 4,205.50 | 16,587 | 10,706.65 |
| Bureau of Lighthouses | 11 | 1.95 | 18 | 3.80 | 79 | 22.60 | 38 | 10.15 | 39 | 10.90 |
| Bureau of Navigation. | 115 | 40.40 | 222 | 71.85 | 178 | 149.65 | 264 | 144.95 | 4,877 | 801.15 |
| Bureau of Standards.. | 68 | 14.00 | 125 | 23.65 | 978 | 115.24 | 1,572 | 213.85 | 3,081 | 415.00 |
| Steamboat-Inspection Service..... | 33 | 4.85 | 91 | 7.75 | 49 | 5.00 | 51 | 5.20 | 52 | 5.15 |
| Total..... | 7,114 | 1,486.06 | 9,395 | 14,988.95 | 430,775 | 8,712.94 | 11,248 | 6,271.75 | 41,527 | 13,793.35 |

^a A large percentage of these figures represents the distribution, at a nominal sales price, of economic circulars of the Bureau of Fisheries. These circulars often discuss subjects of practical utility to the householder, and have a popular demand.

^b Figures include all publications of the Bureau of Manufactures and Statistics for years prior to 1913, those two bureaus being consolidated into the Bureau of Foreign and Domestic Commerce by the act of Aug. 23, 1912.

^c Includes \$27.10 received for subscriptions, and \$13,255 from sales of the 1911 World Trade Directory.

^d These figures include 17,150 copies of two publications sold at a nominal price for free redistribution.

^e Includes \$2,749.75 received for subscriptions, and \$2,450 from sales of the 1911 World Trade Directory.

^f Includes \$1,937.30 received for subscriptions, and \$1,090 from sales of the 1911 World Trade Directory.

^g Includes \$3,945 received for subscriptions.

^h Includes \$21.25 received for subscriptions.

ⁱ Includes \$84.25 received for subscriptions.

When there is deducted from the annual totals in the foregoing table \$16,795 received from sales of the World Trade Directory in 1911, 1912, and 1913, the receipts in 1914 from sales of the Department's publications show a very large increase, the amount being more than double that for any prior year.

MONTHLY LIST OF PUBLICATIONS ISSUED BY THE DEPARTMENT.

In order to meet a constantly growing demand for information concerning the publications of the Department, the Division is now compiling and having printed each month a list of publications

issued by the Department during that month. The first issue of this pamphlet appeared for the month of July, 1914, and was issued during the first week in August. The list contains the title of each publication issued by the Department, and each chart issued by the Coast and Geodetic Survey for sale, together with a short syllabus under each title describing the contents of the publication. The pamphlet has also considerable condensed information concerning the publications of the several bureaus and offices of the Department, and how such publications may be obtained, with the prices at which they are sold by the Superintendent of Documents in cases where he has a supply on hand for selling purposes.

It is intended to make a liberal distribution of this list, in order that the public may be thoroughly and promptly advised as to the publication work of the Department.

ADVERTISING.

On June 19, 1913, the Department directed that whenever it is proposed to make purchases or enter into contracts that will necessitate an expenditure amounting to \$1,000 or more, proposals for furnishing the materials, services, or supplies desired or for the construction work involved shall be advertised for in one or more newspapers in the locality where said purchase is to be made or contract is to be performed, except in the case of purchases of patented articles or devices. The result was to increase in 1914 the amount of advertising done by the Department, as shown by the following statement, showing, for each of the past five years, by bureaus and offices, the number of advertisements inserted in newspapers, the number of authorities issued, the number of insertions authorized, and the total cost of such advertisements.

| Bureau or office. | Advertisements inserted. | | | | | Authorities to publish issued. | | | | |
|------------------------------|--------------------------|------|------|------|------|--------------------------------|------|------|------|------|
| | 1910 | 1911 | 1912 | 1913 | 1914 | 1910 | 1911 | 1912 | 1913 | 1914 |
| Office of the Secretary..... | 2 | 3 | 2 | 6 | 2 | 8 | 12 | 8 | 22 | 10 |
| Bureau of the Census..... | 4 | | | | | 67 | | | | |
| Coast and Geodetic Survey.. | | | | | 11 | | | | | 29 |
| Bureau of Fisheries..... | 7 | | 1 | 6 | 6 | 26 | | 6 | 28 | 27 |
| Bureau of Lighthouses..... | 36 | 22 | 24 | 21 | 138 | 137 | 70 | 98 | 103 | 454 |
| Bureau of Standards..... | | 1 | | | 2 | | 4 | | | 6 |
| Total..... | 49 | 26 | 27 | 33 | 159 | 238 | 86 | 112 | 153 | 526 |

| Bureau or office. | Insertions authorized. | | | | | Total cost. | | | | |
|------------------------------|------------------------|------|------|------|-------|-------------|---------|---------|---------|------------|
| | 1910 | 1911 | 1912 | 1913 | 1914 | 1910 | 1911 | 1912 | 1913 | 1914 |
| Office of the Secretary..... | 28 | 40 | 28 | 60 | 26 | \$38.55 | \$74.95 | \$36.35 | \$83.76 | \$47.20 |
| Bureau of the Census..... | 182 | | | | | 620.66 | | | | |
| Coast and Geodetic Survey.. | | | | | 74 | | | | | 111.66 |
| Bureau of Fisheries..... | 77 | | 17 | 80 | 64 | 129.93 | | 32.55 | 104.39 | 103.17 |
| Bureau of Lighthouses..... | 428 | 208 | 250 | 285 | 1,226 | 932.22 | 345.55 | 462.48 | 472.31 | 1,804.15 |
| Bureau of Standards..... | | 12 | | | 18 | | 18.90 | | | 34.06 |
| Total..... | 715 | 260 | 295 | 434 | 1,408 | 1,721.36 | 439.40 | 531.38 | 660.46 | \$2,100.23 |

* Figures subject to slight revision, owing to a few estimates of cost having been made in cases where newspapers have delayed rendering bills.

An analysis of this table shows that during 1914 a total of 159 advertisements were inserted in various newspapers, the average number of newspapers used in each case was 3.31, the average number of insertions was 2.68, and the average cost of advertising in each case was \$13.21, the average cost for each insertion of an advertisement being \$1.49.

It is apparent that the cost of this advertising was insignificant in comparison with the benefits derived from more satisfactory contracts due to wider publicity being given to Department needs. More extensive advertising also avoids any possibility of a charge by any contractor that he was not given ample opportunity to become a bidder for furnishing supplies to or doing work for the Department.

DIGEST OF THE CONGRESSIONAL RECORD, ETC.

The Division prepared for each day Congress was in session a digest of the Congressional Record, in sextuplicate, for the use of the Secretary, the Assistant Secretary, the Solicitor, the Chief Clerk, the Director of the Census, and the Chief of the Bureau of Foreign and Domestic Commerce. Also congressional bills, reports, documents, and pamphlet laws were scrutinized in this Division and judicious distribution of the Department's allotment was made to the chief officers and the heads of the various bureaus of such as pertained to the administration of the Department.

CHANGES IN DEPARTMENTAL POLICY OR PRACTICE AFFECTING THE WORK OF THE DIVISION.

During the past year there have been a number of changes in departmental policy or practice affecting the work of the Division of Publications. Some of these are mentioned in other parts of this report, and others are so lacking in importance as not to justify specific reference to them. Some of the more important ones not elsewhere mentioned are, however, briefly summarized in the following paragraphs:

On October 1, 1913, when the Department was moved to its new building at Nineteenth Street and Pennsylvania Avenue NW., there were invoiced and transferred to the office of the Chief Clerk the stocks on hand of all blank books, blank forms, and other printed supplies previously carried by the Division of Publications. All files, furniture, and property used in connection with the work of packing and shipping these supplies and the keeping of records thereof were at the same time transferred to the office of the Chief Clerk, as were also two clerks engaged on the work.

In October, 1913, the Division of Publications recommended that the Department discontinue the practice of furnishing to the Public Printer paper used for printing letterheads (purchased from the Department's contingent fund) and purchase such paper from the Government Printing Office (paying for it from the Department's allotment for printing and binding), in order that the hauling of such stock to the Government Printing Office and the keeping of numerous records incident to purchasing and storing the paper might be avoided. This recommendation was approved by the Department, and the

Public Printer was requested to furnish samples of paper carried in stock by him suitable for letterheads, together with the prices charged, in order that a selection of paper might be made for the use of the Department. Before such selection had been made an opinion was rendered by the Attorney General (Dec. 30) to the effect that under the law the Public Printer is not authorized to print on stock furnished by the departments. Congress subsequently, however, by the urgent deficiency act approved April 6, 1914, authorized the Government Printing Office to use paper then owned by any executive department in executing work for such department. The paper owned by the Department of Commerce has now nearly all been used, and hereafter the Department will print its letterheads on stock furnished by the Public Printer. It has, however, adopted a paper of lighter weight than has been used heretofore, and as a result a considerable saving (about \$1,000 per annum) will be effected in the cost of such paper.

Commencing July 1, 1913, the Division, by authority of the Secretary, discontinued the practice of making typewritten copies and filing estimates of cost of printing and binding furnished by the Public Printer. The four principal items of cost in these estimates—printing (composition, imposition, electrotyping, and presswork), bindery operations, illustrations, and stock—are now entered in the record of requisitions for printing and binding (in which the other information contained in the estimates has always been entered), thereby creating a more convenient record and at the same time saving the time necessary to typewrite and file annually over 3,000 detailed estimates.

In December, 1913, the Superintendent of Documents was authorized to insert on the backs of title-pages or elsewhere in the publications of the Department which are carried in his sales list a note to the effect that additional copies of such publications can be obtained from his office upon the payment of a stated amount per copy. The purpose of this action was to cooperate with the Superintendent of Documents in making a wide distribution of the various publications of the Department, and in that way making the public more familiar with the Department's work.

On October 17, 1913, the Department gave the Superintendent of Documents blanket authority to reprint any of its publications, not of a confidential character, whenever he may see fit to do so, for sale purposes. Prior to that date, each time the Superintendent of Documents desired to print a publication of the Department he wrote a letter requesting permission to do so, which letter required an answer from the Department. This permission was never denied, and in giving a blanket authority the Superintendent of Documents and the Division of Publications are saved the work incident to writing and filing several hundred letters each year.

In January, 1914, the Department approved two recommendations of the Division relative to printing notices on the backs of title-pages of the Department's more expensive publications, designed to influence persons on mailing lists to have their names removed in cases where the publications are not of especial value to them and to secure the return to the Department of publications which have served their purpose.

In December, 1913, and in January, 1914, the Division directed attention to the delay in issuing some of the annual administrative reports of the Department and suggested the possibility of issuing all these reports prior to January 1 of each year. The Department also took the view that these reports were sometimes unnecessarily delayed. However, before final and definite action had been taken looking to an improvement, the matter became the subject of legislation by Congress, the sundry civil act of August 1, 1914, directing that appropriations in that act for printing and binding should not be used for any annual report or the accompanying documents unless the head of each executive department, or other branch of the public service, making such a report shall furnish copy to the Public Printer in the following manner: Copies of the documents accompanying such annual reports on or before October 15, copies of the annual reports on or before November 15, and complete revised proofs of the accompanying documents and the annual reports on November 10 and 20, respectively. Section 80 of the printing bill now before Congress provides also that copy for annual reports shall be furnished the Public Printer for printing not later than November 1 of each year.

In January, 1914, the Department approved a recommendation of the Division that hereafter all of the annual administrative reports of bureaus and offices of the Department be set solid. This action affected five reports, and its purpose was to dispense with the necessity of drawing the leads from between lines and remaking-up the reports for the volume containing the consolidated reports of the Department. Thus both considerable expense and the possibility of error resulting from the remake-up are avoided.

There is maintained in the Steamboat-Inspection Service a complete card index of all licenses issued to officers of merchant steam, motor, and sail vessels. This card index appears to provide in a convenient form for reference all the information required by section 4411, Revised Statutes, in compliance with which there is printed annually a list of such officers licensed, at a cost sometimes exceeding \$2,500. After a conference between the Steamboat-Inspection Service and the Division, parties interested in these printed lists were circularized with a view to finding out the extent of the demand for the publication. Answers received in response to the circular sent out indicated that the expense of printing the document was not justified. Accordingly, the Department requested the Joint Committee on Printing to incorporate in the printing bill now before Congress a clause repealing section 4411, Revised Statutes, thereby authorizing the Department to dispense with the publication. This repealing clause has been inserted in the printing bill, and it is probable that not more than one more edition of the publication (that for the fiscal year 1914) will be printed.

On September 30, 1913, the Department approved a recommendation that the Bulletin of the Bureau of Standards be placed on a sales basis and that in future its free distribution be limited to certain libraries, technical societies, and public officials. Accordingly, in January, 1914, the Department's stock of Bulletins was turned over to the Superintendent of Documents for sale purposes, and commencing with volume 10, No. 1, the Bureau's edition was reduced from 2,500 copies to 1,500 copies.

Requests received in February, 1914, for reprints of certain Department circulars which had become exhausted suggested to the Division that there might be an improvement in the system of numbering this series of circulars. To take a concrete case, Circular 236, "Regulation of motor boats," had been printed in very large quantities. Possibly 200,000 copies were in the hands of motor-boat owners and others, most of whom had probably become more familiar with the number than with the title of the circular. The first edition of the circular was printed in February, 1913, and bore the name of the at that time Acting Secretary of the Department. The Division thought that a reprint of this circular should bear the name of the present head of the Department. To do this, however, required (if the former practice of the Department were continued) that the circular be given a new date, and therefore a new number. This in turn created the necessity of supplying copies of the new circular both to parties on the mailing list and to all parties throughout the country who are interested in the subject of the regulation of motor boats, which did not appear to be necessary, because the proposed change was so slight. The Division therefore recommended that a circular on a given subject retain for all time the serial number first assigned to it and that later editions be distinguished from the first issue by edition memoranda only (second edition, third edition, etc.), instead of being issued as new circulars with new numbers. This recommendation was approved by the Department. The new practice, when changes in reprints are unimportant, not only saves the cost of printing the quantity necessary for the mailing list (required to keep files complete) and for miscellaneous distribution, but also avoids confusion caused by changing numbers after officials of the Department and the public have become familiar with the old numbers.

During November, 1913, the Division examined proofs of several thousand plates which had been preserved at the Government Printing Office for possible future use, and it was ascertained that at least half of them would never be used again. Authority was therefore given the Public Printer for remelting the useless plates.

On June 28, 1913, the several bureaus and offices of the Department were directed to furnish to the Disbursing Clerk monthly reports of cost operations under certain headings, one of which is "Printing and binding." To enable the bureaus and offices to comply with this direction, it became necessary for the Division to furnish participants in the Department's allotment from the appropriation for printing and binding a list of charges submitted by the Public Printer. This information is furnished in the form of a list of the requisitions against which bills have been rendered, a description of the work ordered under each requisition, and the amount of the charge against each requisition. The preparation of these statements monthly has, however, entailed upon the Division considerable extra work.

Under the law filing devices, loose-leaf binders, etc., may be purchased and paid for from either the contingent appropriation or printing and binding allotment of the Department. It had grown to be the custom, however, to purchase these articles from the Public Printer regardless of whether it was more economical to do

so. Therefore, in April, 1914, the Department authorized that such purchases be made from the schedule of the General Supply Committee whenever such articles can be purchased therefrom at a lower cost than from the Government Printing Office, provided that the funds available for contingent expenses will permit of purchases in that way.

On July 2, 1913, the Division discontinued the practice of preparing vouchers for the signature of companies from which purchases of envelopes are made. Since that time these vouchers have been made up by the companies themselves. The purpose of discontinuing the practice was to save to the Department a considerable amount of clerical work involved in making up the vouchers.

Heretofore when the Division, as frequently happened, prepared a number of letters in the same form the practice was to write in each case one original and to preserve in the files a carbon copy of each original. In December, 1913, the Department authorized the Division, in cases of this kind, to file only one copy of the letter, with a notation that copies had been forwarded to certain enumerated persons or bureaus; also to write several carbons at one time and to use such carbons as originals. This change in practice not only avoids encumbering the files of the Department, but saves a great deal of useless typewriting.

REVISION OF LAWS RELATING TO PUBLIC PRINTING AND BINDING.

On March 3, 1905, Congress created a Printing Investigation Commission and directed it to inquire into the laws relating to the public printing and binding and recommend such legislation as might in its opinion improve these laws. The work of this commission extended through several sessions of Congress and was thorough. It discovered many faults in the application of the present laws and remedied them where it had power to do so, and in a few cases glaring defects needing prompt attention were cured by legislation. It eventually, however, presented to Congress a complete revision of the printing laws, which was introduced during the second session of the Sixty-second Congress as Senate bill 4239. This bill was reported to the Senate in January, 1912, and passed that body on April 9 following. It was fully considered by the Committee on Printing of the House of Representatives and, with sundry amendments, was favorably reported to the House on June 1, but no further action was taken by that Congress.

A similar bill, embodying the amendments made during debate in the Senate and the recommendations of the House Committee on Printing, was introduced in the Sixty-third Congress. It was presented in the Senate (S. 825) by Mr. Smoot and in the House (H. R. 6539) by Mr. Barnhart, and was referred to the Printing Committees of the respective Houses.

On April 22, 1914, S. 5340 and H. R. 15902, practically identical in language, were reported to the Senate and House of Representatives, respectively (Senate Report No. 438 and House Report No. 564, 63d Cong., 2d sess.), in lieu of S. 825 and H. R. 6539, and were placed on the Calendars of the two Houses. On August 12, 1914, H. R. 15902 became the order of business for Calendar Wednesday in the House; on August 26 general debate on the bill was closed and

the reading of the bill for amendment under the five-minute rule was commenced.

The Senate and House committee reports, like the bills, are identical in form and substance. They quote extensively from the annual reports of the Secretary of Commerce and the Chief of the Division of Publications for the fiscal year ended June 30, 1913, and include also certain correspondence between the Department and the Joint Committee on Printing. Commencing on page 25 of each report is a complete and very interesting explanation of the bills, by sections.

ESTIMATES.

The following estimates for the personnel of the Division of Publications, for printing and binding for the Department of Commerce, and for contingent expenses of the Division of Publications for the fiscal year 1916 are submitted, with the request that the same be included in the Department's estimates to Congress:

PERSONNEL, DIVISION OF PUBLICATIONS.

| | |
|--|----------|
| Chief, Division of Publications..... | \$2, 500 |
| Assistant Chief, Division of Publications (submitted)..... | 2, 100 |
| 2 clerks of class 4..... | 3, 600 |
| 2 clerks of class 3..... | 3, 200 |
| 3 clerks of class 2..... | 4, 200 |
| 2 clerks of class 1 (increase of 1 submitted)..... | 2, 400 |
| 4 clerks, at \$1,000 each..... | 4, 000 |
| 3 clerks, at \$900 each (increase of 1 submitted)..... | 2, 700 |

NOTE.—There are now employed in the Division of Publications 3 clerks at \$900 each, 1 of whom is on detail from the Bureau of Foreign and Domestic Commerce. The estimate is submitted so as to cover the clerk who is detailed to the Division.

| | |
|--|--------|
| 4 assistant messengers, at \$720 each (increase of 2 submitted)..... | 2, 880 |
|--|--------|

Provided, That any employee of the Department of Commerce who has had at least one year's satisfactory experience as an operator of duplicating machines shall hereafter be eligible for promotion to assistant messenger, regardless of the law relating to apportionment.

| | |
|--------------------------------------|-----|
| 1 laborer, at \$660..... | 660 |
| 2 laborers, at \$480 each..... | 960 |
| 2 messenger boys, at \$480 each..... | 960 |

| | |
|----------------------------|---------|
| Total (27 employees) | 30, 160 |
|----------------------------|---------|

The work devolving on the Division of Publications continues to increase without regard to the personnel available for it. Within the past year the duplicating section has very greatly developed, at large cost to the other branches of the Division. For instance, this work has reached the point where a considerable part of the services of two employees of the editorial section are devoted to preparing copy, reading proof, and revising incident to it. In addition, one of the three clerks in the mailing section is required to give nearly all of his time to supervisory work and keeping of records in connection with the duplicating machines, and considerable time of a messenger must be utilized in delivering completed work and proofs to the bureaus. The work of the bookkeeping and accounts section has also been greatly added to since the keeping of records of expenditures for printing and binding for the Bureau of the Census has devolved on the Division, and since the adoption of the practice of compiling and fur-

nishing each month to the various bureaus, offices, and services statistics for use in making up their cost-keeping reports.

Practically all of this growth has taken place within a year and has been at a possible sacrifice of efficiency in some branches of the work. As an example, the editorial force, which has never been more than a skeleton of an efficient force, has necessarily had to contribute to the congested sections and allow its work to go largely by default, with an unjustified hope that tangles, if any, may be straightened out either in the bureaus or at the Government Printing Office.

These conditions are unsatisfactory and should be remedied by additions to the personnel. It is not believed that there is a similar office in any department which attempts to do so much with a small force as the Division of Publications, and the Division feels that its work must suffer unless its personnel is increased to the point where pressure is not being constantly applied to produce quantity, sometimes at the cost of quality.

To meet the conditions complained of, the estimates for the personnel for the fiscal year 1916 provide for an assistant chief of the Division of Publications (a new position), 1 additional clerk at \$1,200 per annum, 1 additional clerk at \$900 per annum, and 2 additional assistant messengers at \$720 per annum each, a total increase of 5 employees. One of them, however (the clerk at \$900 per annum), is at present detailed to the Division from the Bureau of Foreign and Domestic Commerce, and will no doubt be dropped from the estimates of that Bureau. These positions are all needed badly, and there is not the slightest doubt that the public interests would be subserved were the personnel of the Division increased even beyond the requests submitted.

The salary at present received by the clerk performing the functions of assistant chief is entirely out of keeping with the trustworthy character of the work and the dignity and responsibility of the position. It may be safely asserted that other officials performing duties which require similar educational qualifications, technical experience, and special prerequisites are, without exception, better rewarded. This is purely a matter of record. In addition, the present case is especially meritorious in that this particular clerk possesses to an unusual degree special training, individual talent, and wide experience in the Department.

The estimates of the Division for the past four years have provided for an assistant chief, and two years ago the item was approved by the Department and forwarded to Congress, but was not included in the appropriations. It is sincerely hoped that this year both Congress and the Department will concur in the recommendation of the Division.

The estimate for an additional clerk at \$1,200 is inserted in order that, if the clerk be provided, the Division may dispense with details to it from other bureaus and offices, which have been necessary heretofore. During the past year there were from time to time formal details to the Division of 7 clerks, who performed 772 hours of service. There were also, in addition to overtime work, a number of informal details, which would increase very largely the hours of service given above.

Two additional messengers are desired for assignment to the duplicating section. As already stated, the work of this section has so

grown that it is now entirely out of proportion to the personnel available for it, and unless additional help is provided the usefulness of the section to the several bureaus, offices, and services of the Department will be greatly curtailed because of the inability of the Division to respond to the constantly increasing demands being made on it for the product of the duplicating machines. At present it is absolutely impossible to do all the work desired by the bureaus, and as a consequence it is often necessary for high-salaried clerks in the bureaus to typewrite material which could be duplicated at much lower cost and probably much more accurately by the machines in this Division. Further, nearly all of the work of the duplicating section is of such a nature that any delay in its execution lessens its value. Trade opportunities for American manufacturers and exporters, which are given publicity by means of multigraphed letters and notices, comprise a class of work that is not permitted to remain unfinished over night, and though operators of the duplicating machines have become expert in the manipulation of the machines the force is almost daily required to work extra hours.

A proviso has also been suggested in the estimates which, if enacted into law, will permit of the promotion of skilled operators of duplicating machines who receive only \$480 per annum. This proviso has been offered with a view to bringing about economical production and maintaining a satisfied and ambitious personnel. The Division has now at least three employees engaged on this work who have become exceedingly capable and deserving of advancement, but as they were certified from registers which do not permit of such advancement they are required to continue to render a very high grade of service for only \$480 per annum, with no hope of promotion, while vacancies at \$720 per annum are occasionally filled by new appointees with no experience and sometimes less application and natural ability. This, of course, results in injustice and must in time have the effect on these ambitious employees that always follows when the avenue of advancement is closed. Though in other departments the entrance salary for operators of these machines is \$720, and sometimes more, per annum, the Division believes that \$480 is sufficient compensation during the apprenticeship period of young men and women assigned to this work, but that when they become experienced and skilled the law should permit them to be advanced to a higher and more equitable salary. The proviso is therefore submitted in the belief that its justice and the propriety of its being enacted into law will readily appeal to Congress.

The Division desires to add also to its estimates a recommendation that its personnel be estimated and appropriated for under a separate and distinct heading, so as to give the Division an individual status. This plan was adopted many years ago by the department whose division of publications is probably the only one which may properly be compared to the Division of Publications in the Department of Commerce. Both the present and the former chiefs of this Division have long entertained the opinion that it should be appropriated for specifically, and in view of the probable early passage of the printing bill, which provides for the establishment in each department of a division of publications, and which seems to contemplate a distinct entity for each such division, it appears to be a particularly opportune time to make this recommendation. It is believed that the printing bill, when passed, will furnish the necessary authority of law

for appropriating for the Division in the manner recommended, and preclude the point of order which is frequently made against new legislation.

Many of the employees of the Division of Publications, unlike those of most Government offices, are men and women of technical experience and training whose services command a higher rate of compensation in the labor market than others less skilled and experienced. Capable editorial clerks, for example, must not only have a good education, but also a high degree of technical training and a wide general knowledge, as well as the faculty—acquired only from extensive experience—logically to analyze and readily to comprehend what is read, and to detect errors, inaccuracies, and inconsistencies that would escape the ordinary reader. These, if permitted to appear in the printed work, would often detract from the value of a publication and might sometimes result in embarrassment to the Department. It is a matter of record also that the revision and editing in this Division of manuscripts of many of the Department's publications have resulted in large annual savings in the printing and binding allotments.

The position of editorial clerk, therefore, is more technical and more important than its title would generally signify, and this is recognized by the Civil Service Commission in the examination which it offers to candidates. This examination embraces all the first-grade subjects, which constitute the entire examination for the regular departmental clerical service, and in addition (1) editing, (2) indexing, (3) abstracting, (4) proof reading, and (5) book making. The entrance salary has also until recently been fixed at \$1,400, but owing to eligibles on the regular register declining to accept positions at lower salaries an effort was made during the past year to establish a special register of eligibles who would accept salaries as low as \$1,000. This effort was the result of the failure of this Division to get an eligible to accept a vacancy at \$1,000 which remained unfilled several months and was eventually otherwise filled, because an experienced editorial clerk, though very badly needed, could not be obtained.

These conditions are recognized also by other branches of the service, in and out of the Department, where editorial clerks invariably receive higher salaries than are paid in this Division, which numbers among its employees some of the most competent editorial clerks in the service. The result is that it is difficult for the Division to retain its clerks, because appointees are frequently induced to accept positions elsewhere at higher salaries. For instance, two editorial clerks formerly in the Division are now receiving \$2,000 per annum each in other bureaus of the Department, while a third only a few weeks ago resigned to accept a position at \$2,500 per annum in the Consular Service, offered him after his fitness had been demonstrated by a most exacting examination. Many responsible positions in other departments are filled by former employees of the Division who found that the opportunity offered here did not justify their remaining. This absence of opportunity is due to two causes—(1) the low salaries prevailing and (2) the uncertainty of receiving promotion to vacancies which may occur in the Division so long as its identity is lost among several other offices.

Conditions may, however, be considerably bettered by separately appropriating for the Division and giving to it the position of assistant chief as requested, as the new position would permit of the promotion of several deserving clerks who have rendered the Department faithful and exceedingly valuable services. The proposed change in the manner of appropriating for the Division and the additions recommended to the personnel would undoubtedly result also in true economy and a greater security to the Department's allotment for printing and binding, as it would be possible to more thoroughly edit, revise, and perfect—typographically and otherwise—the numerous publications of the Department, and the consequent saving and benefit would cause the salary of the proposed assistant chief to appear practically inappreciable in comparison.

Should the foregoing recommendations be approved by the Department and by Congress, the form of the estimate and appropriation would be as follows:

Division of Publications.—Chief, Division of Publications, \$2,500; assistant chief, \$2,100; clerks—two of class four, two of class three, three of class two, two of class one, four at \$1,000 each, three at \$900 each; four assistant messengers: *Provided*, That any employee of the Department of Commerce who has had at least one year's satisfactory experience as an operator of duplicating machines shall hereafter be eligible for promotion to assistant messenger, regardless of the law relating to apportionment; one laborer; two laborers, at \$480 each; two messenger boys, at \$480 each; in all \$30,160.

PRINTING AND BINDING, DEPARTMENT OF COMMERCE.

For the Department of Commerce, including the Coast and Geodetic Survey and the Bureau of the Census, \$441,000.

In accordance with the usual practice, each of the offices sharing in the allotment to the Department for printing and binding was requested to furnish for the fiscal year 1916 an estimate as to the class, size, and edition of each publication which it expected to submit for printing, the number of volumes to be bound for library and office use, and the probable percentage of increase or decrease as compared with 1914 in miscellaneous job printing. This information was furnished in most cases, and the estimate as submitted is based on the probable cost of the work which the bureaus and offices will require.

The total of the estimates submitted by the several bureaus and offices is \$473,382. As a rule, increases were requested, and usually the reasons advanced for the increases were convincing. However, the Division doubts the propriety at this time of asking Congress for a large increase in the Department's allotment, and it has consequently revised the estimates very carefully, with the result that the total has been decreased to \$441,000 (a decrease of \$32,382), which is the amount that was available for the fiscal year 1914. For the fiscal year 1915, however, Congress reduced the Department's allotment to \$400,000. Consequently, as compared with the current fiscal year an increase of \$41,000 is desired for 1916. With \$441,000 it is believed that it will be possible to meet all requirements which may reasonably be anticipated at this time.

The statement following shows the average expenditures in 1908–1913, expenditures in 1914, suballotments for 1915, and estimates (both of the bureaus and the Division of Publications) for 1916 for printing and binding for the Department of Commerce, by bureaus, offices, and services.

| Bureau, office, or service. | Average expenditures, 1908-1913. | Expenditures, 1914. | Suballotments, 1915 | Estimates, 1916. | |
|---|----------------------------------|---------------------|---------------------|------------------|-------------|
| | | | | Bureaus. | Division. |
| Office of the Secretary (Secretary, Assistant Secretary, Solicitor, Chief Clerk, and Division of Publications)..... | \$17,912.25 | \$12,655.94 | \$13,925.00 | \$13,500.00 | \$13,500.00 |
| Appointment Division..... | | 383.58 | 400.00 | 400.00 | 400.00 |
| Disbursing Clerk..... | | 998.09 | 900.00 | 900.00 | 800.00 |
| Division of Supplies..... | | 505.43 | 400.00 | 550.00 | 500.00 |
| Bureau of the Census..... | | (*) 110,758.32 | 120,000.00 | 157,260.00 | 144,300.00 |
| Coast and Geodetic Survey..... | 28,777.00 | 28,837.49 | 28,000.00 | 36,000.00 | 30,000.00 |
| Bureau of Corporations..... | 10,852.61 | 10,468.46 | 11,000.00 | 11,000.00 | 11,000.00 |
| Bureau of Fisheries..... | 11,716.18 | 12,687.49 | 12,000.00 | 15,900.00 | 18,500.00 |
| Bureau of Foreign and Domestic Commerce..... | 140,223.07 | 132,039.95 | 113,500.00 | 125,135.00 | 120,000.00 |
| Bureau of Lighthouses..... | 20,357.50 | 25,560.31 | 22,000.00 | 27,987.00 | 25,000.00 |
| Bureau of Navigation..... | 11,402.35 | 12,473.34 | 12,500.00 | 13,000.00 | 13,000.00 |
| Bureau of Standards..... | 13,950.91 | 28,033.31 | 23,000.00 | 28,750.00 | 27,000.00 |
| Office, Supervising Inspector General, Steamboat-Inspection Service..... | 4,190.97 | 2,637.22 | 3,000.00 | 3,000.00 | 3,000.00 |
| Division of Publications for— | | | | | |
| Lighthouse Service..... | 9,261.76 | 7,298.93 | 9,300.00 | 9,000.00 | 9,000.00 |
| Steamboat-Inspection Service..... | 9,409.75 | 8,768.90 | 9,300.00 | 9,000.00 | 9,000.00 |
| Shipping and Radio Services..... | 2,777.70 | 3,540.60 | 5,100.00 | 5,000.00 | 5,000.00 |
| Customs Service..... | 9,418.97 | 13,353.41 | 9,300.00 | 10,000.00 | 10,000.00 |
| Reserve..... | | | 6,375.00 | 7,000.00 | 6,000.00 |
| Total..... | | 410,700.77 | 400,000.00 | 473,382.00 | 441,000.00 |

* Prior to the fiscal year 1913, printing and binding for the Bureau of the Census was paid for from separate appropriations. In 1913 the Department's allotment bore the cost of the printing for the permanent Census, but as the Bureau was during that year still engaged on Thirteenth Census work the Department expended for it only \$38,270.24, of which \$5,011.48 was reimbursed from other appropriations.

As is shown by the table, considerably more than half of the increase desired for 1916 is intended to be suballotted to the Bureau of the Census, expenditures for which are variable from year to year according to the nature and extent of the inquiries conducted by that Bureau. The next largest increase is that for the Bureau of Foreign and Domestic Commerce, whose duties, and consequently whose printing needs, are being constantly increased by legislation. The Bureau of Standards also has in recent years had its functions widened from time to time by Congress, and its publication work has increased in proportion. In fact, this is true in some measure of all the bureaus, offices, and services of the Department.

It is believed, therefore, that the estimate submitted is very modest, in view of the fact that it merely requests the restoration of the allotment which was made to the Department for 1914, and which unfortunately was reduced for the current fiscal year.

CONTINGENT EXPENSES, DIVISION OF PUBLICATIONS.

It is estimated that the requirements for the contingent expenses of the Division of Publications for the fiscal year 1916, except light, heat, and power, will be as follows:

| | |
|--|---------|
| 1. Equipment and repairs to same (including furniture of all kinds, filing devices, typewriters, duplicating machines, and other mechanical appliances)..... | \$2,400 |
| 2. Stationery (including paper, envelopes, inks, desk supplies of all kinds, etc.)..... | 2,425 |
| 3. Telephones..... | 50 |
| 4. Books and periodicals..... | 25 |
| 5. Travel (street-car tickets)..... | 25 |
| Total..... | 4,925 |

CONCLUSION.

The Division of Publications appreciates the fact that a successful administration of any large institution is dependent first of all on cooperative effort by every unit of its organization and every component part of each unit. The employees of this Division have on their part put forth this effort and have at no time shirked any responsibility or duty which might contribute to the well being and advancement of the division unit or the department whole. As a partial reward and recompense for this effort, the estimates for the personnel have been submitted with a view to advancing at least some of them to salaries more nearly commensurate with the services performed by them, and it is sincerely hoped that these estimates may be approved in order that this purpose may be carried out.

The Division desires to acknowledge also the cooperation of the several bureaus and offices of the Department, the heads of which, without exception, have always been generous and forbearing in their dealings with the Division. Such cooperation makes for the best results, and the Division is pleased to be a part of a great and useful Department where consistent harmony prevails throughout.

Respectfully,

DAN C. VAUGHAN,
Chief, Division of Publications.

To Hon. WILLIAM C. REDFIELD,
Secretary of Commerce.

74607°—COM 1914—52

INDEX.

| | Page. |
|--|-----------------------|
| Abstract of the Census, issued..... | 89,368 |
| Accidents on navigable waters..... | 174,701 |
| investigations..... | 712 |
| <i>See also</i> Wrecks. | |
| Actuarial statistics, publication..... | 76,373 |
| Addition to Commerce Building..... | 9 |
| Administrative changes, Coast and Geodetic Survey..... | 165 |
| Foreign and Domestic Commerce Bureau..... | 43 |
| Lighthouse Bureau..... | 473,478-480 |
| <i>See also</i> Personnel. | |
| Advertising, proposals for materials or services, amount and cost..... | 805 |
| specimen of fraudulent..... | 66 |
| Afognac Reservation, effects of volcanic eruption..... | 101,433,460 |
| fish-cultural work..... | 428 |
| <i>See also</i> Alaska. | |
| Agents, activities of commercial..... | 18,42,44,207 |
| Ages of farmers, census report..... | 75,368 |
| Agricultural implement industry, investigation..... | 50,52,233,235 |
| report on International Harvester Co..... | 263 |
| Agriculture, census..... | 17,18,70,74,75,80,380 |
| report on plantations in the South..... | 379 |
| Aids to navigation, Alaska. 17,118,477,530,557,566 | |
| characteristics of lights..... | 506,407 |
| classified list..... | 505 |
| construction completed..... | 562-567 |
| damaged by collisions..... | 537 |
| fog signals, established, improved, and discontinued..... | 517 |
| number and type..... | 507 |
| gas buoys established and discontinued.... | 517 |
| Guantanamo, Samoa, and Guam..... | 477 |
| illumination used..... | 506,508-512 |
| improved types..... | 121-123,484-487 |
| increase in number..... | 474 |
| lights, discontinued..... | 515 |
| established..... | 512 |
| improved in illumination..... | 514 |
| to be established in 1915..... | 515 |
| maintained under contract..... | 519 |
| maintenance costs..... | 482-484 |
| new aids established..... | 475 |
| Norfolk Harbor, Va..... | 528,564 |
| private..... | 497,519 |
| reporting of defective..... | 113 |
| storm damage..... | 476 |
| submarine signals, established and discontinued..... | 518 |
| number in commission..... | 518 |
| <i>See also</i> Coast and Geodetic Survey; Lighthouses Bureau; Wire-drag work; Wrecks. | |

| | Page. |
|---|--------------------|
| Alabama, field operations, Coast and Geodetic Survey..... | 610,611,612 |
| pearl-button industry..... | 419 |
| Alaska, aids to navigation..... | 17,118,477,566 |
| construction of additional..... | 530 |
| coast line..... | 120,132 |
| demarcation of boundary..... | 168,576,675 |
| estimate for lighthouse depot..... | 557 |
| expedition to Mount St. Elias..... | 680 |
| field operations, Coast and Geodetic Survey..... | 625-637 |
| fisheries..... | 14,95,198,462,463 |
| fur-seal industry..... | 14,97,458 |
| hydrographic surveys..... | 572,573,580 |
| international boundary survey..... | 576,675 |
| lighthouse vessels needed..... | 17,120,123,477 |
| minor fur-bearing animals..... | 14,100,460-462 |
| salmon propagation..... | 433 |
| school facilities, seal islands..... | 97 |
| Sitka magnetic observatory..... | 586 |
| special study of conditions..... | 106 |
| social conditions on seal islands..... | 100,106 |
| status of geodetic work..... | 161-163 |
| surveys and soundings..... | 14-16,151,172,173 |
| estimate for new vessels..... | 18,19,134-142 |
| transcripts distributed..... | 167 |
| wire-drag work..... | 18,143-148,150-158 |
| wireless telegraph on seal islands..... | 97 |
| wrecks of vessels..... | 17,119,143-150,156 |
| <i>See also</i> Afognac Reservation; Aleutian Islands; Pribilof Islands, etc. | |
| Albacore fishery. <i>See</i> Tunny fishery. | |
| Albatross, operations of steamer..... | 91,451 |
| Albemarle Sound, shad fishery..... | 413 |
| Alcohol, investigation of properties..... | 320 |
| Aleutian Islands, regulations for administration of reservation..... | 103,464,465 |
| <i>See also</i> Alaska. | |
| Alice, sinking of steamer..... | 148,701 |
| Allotment notes issued to seamen..... | 741 |
| Alloys, proposed revision of nomenclature.... | 329 |
| Alms-houses, census of inmates..... | 69,74,370,377 |
| Anacapa Island, Cal., estimate for establishing light station..... | 561 |
| Anchorage grounds, general law to define.... | 194 |
| Anemometers, standard data needed..... | 351 |
| Aneroid barometers, tests..... | 281 |
| Antitrust legislation, Clayton Act, analysis..... | 50, |
| 229,230 | |
| text..... | 245-256 |
| procedure for enforcement..... | 230 |
| review..... | 223-232 |
| <i>See also</i> Federal Trade Commission. | |

| | Page. | | Page. |
|---|------------------------|--|----------------------|
| Appointment Division, compilation of special data..... | 767 | Battery, Md., fish-cultural work..... | 428 |
| report of Chief..... | 753-774 | Beaufort, N. C., fisheries laboratory..... | 93, 456 |
| statistics of personnel..... | 756 | effect of delayed appropriation..... | 197, 198 |
| <i>See also Personnel.</i> | | Beef industry, report published..... | 257 |
| Apportionment of employees..... | 31, 766 | Beet-sugar industry, investigation..... | 51, 233 |
| Appropriations, effect of delayed, incomplete, or insufficient..... | 196-199 | Bells. <i>See</i> Aids to navigation. | |
| Appropriations and expenditures, by bureaus, offices, and services..... | 17, 21-27 | Benevolent institutions, census inquiry.. | 69, 74, 370 |
| Census Bureau..... | 21, 24, 81, 384, 389 | Benzoic acid, standard heating value..... | 62, 237 |
| Coast and Geodetic Survey... .. | 21, 151, 164, 165, 589 | Berlin, commercial attaché..... | 41, 42 |
| Corporations Bureau..... | 21, 22, 365-367 | <i>See also Germany.</i> | |
| Fisheries Bureau..... | 21, 23, 467, 468 | Bermuda Islands, oceanographic surveys.... | 687 |
| Lighthouse Service..... | 21, 24, 114, 487-489 | Bertholf, Capt. Commandant E. P., memorandum in re sinking of revenue cutter | |
| expenditures from all funds..... | 540 | Tahoma..... | 147 |
| unexpended balances..... | 531 | Big Sunflower River, mussel fishery..... | 414 |
| maintenance of Department..... | 14 | Binding, tests of cloth..... | 64 |
| printing and binding..... | 33-39, 777 | <i>See also</i> Printing and binding. | |
| Radio Service expenditures..... | 739 | Biological Survey, transfer of authority over certain fur-bearing animals recommended..... | 102 |
| Standards Bureau..... | 21, 22, 354-356 | Birds, protection of migratory..... | 113 |
| Steamboat-Inspection Service..... | 21, 23, 604 | Births. <i>See</i> Vital statistics. | |
| Aquarium for Bureau of Fisheries..... | 11 | Black River, mussel fishery..... | 414 |
| Ardmore oil field, investigation..... | 51, 52, 233, 235 | Blank books and forms, number and cost of printing..... | 779 |
| Arkansas, field operations, Coast and Geodetic Survey..... | 612, 613, 617 | Blind, census..... | 69, 74, 377 |
| pearl-button industry..... | 419 | Blue Book. <i>See</i> Official Register. | |
| Armeria, lighthouse tender, wrecked..... | 119, | Blue prints of hulls, filing recommended... .. | 175, 704 |
| 143, 149, 156 | | Blueback fisheries, quantity and value of product..... | 403 |
| sale of wreck..... | 524 | Boilers, fusible plugs, durability..... | 329 |
| tender to replace..... | 119 | inspections..... | 706 |
| Army officers in Lighthouse Service... .. | 108, 112, 499 | Boilers of vessels, inspections..... | 174, 177, 184, 706 |
| Arnold, Julian H., commercial attaché at Peking..... | 41, 42 | steel plates, etc., inspected..... | 174, 699 |
| Ashland, Wis., construction of aids to navigation..... | 529 | Bonds of officers..... | 774 |
| Ashtabula, improvement of aids to navigation..... | 529 | Boothbay Harbor, Me., fish-cultural work.. | 428, 442 |
| Asylums, census of inmates..... | 69, 74, 370, 377 | Borers, depredations of marine..... | 94 |
| Atchafalaya Bay, construction of aids to navigation..... | 528 | Boston, branch commercial office..... | 16, 44, 48 |
| Atlantis, rescue of steamer..... | 737 | completion of new fish pier..... | 406 |
| Atlas, Census Statistical..... | 69, 74, 365, 371 | quantity and value of fishery products.. | 395-406 |
| Attachés, commercial..... | 18, 41, 44, 47 | vessel fisheries..... | 88, 394 |
| Automobiles, purchases..... | 12, 20 | Boundaries, international, surveys..... | 168, 574, 666 |
| use in field work..... | 170, 582 | Bozeman, Mont., fish-cultural work..... | 428 |
| | | Branch offices, Fisheries Bureau..... | 104, 464 |
| | | Foreign and Domestic Commerce Bureau.. | 16, |
| | | | 43, 46, 48 |
| Etache, operations of steamer..... | 89, 168, 171, 657 | Brand, E. A., appointed Assistant Chief, Foreign and Domestic Commerce Bureau.. | 43 |
| Baker, Henry D., commercial attaché at Petrograd..... | 41, 42 | Brandywine Shoal, Del., construction of light station..... | 527 |
| Balances turned back to surplus fund.... | 14, 26, 34 | Brick, piers, strength investigation..... | 343 |
| <i>See also</i> Appropriations and expenditures. | | sand-lime, hardening process..... | 344 |
| Baird, Cal., fish-cultural work..... | 428 | <i>See also</i> Pottery industry. | |
| State road through fisheries station..... | 469 | Bridges over navigable waters, lighting.... | 118, 519 |
| Baker Lake, Wash., fish-cultural work..... | 428 | Bronze bar, investigation of expansion..... | 280 |
| Baldwin, A. H., annual report..... | 203-219 | Brussels, International Conference for the Unification of Maritime Law..... | 196 |
| commercial attaché at London..... | 41, 42 | Bryans Point, Md., fish-cultural work..... | 428 |
| Baltimore, branch commercial office..... | 16 | Buenos Aires, commercial attaché..... | 41 |
| use of Fort McHenry Military Reservation..... | 114, 406 | Buffalo fish, propagation experiments..... | 446 |
| Barges. <i>See</i> Vessels. | | <i>See also</i> Fisheries Bureau. | |
| Barometers, tests by Bureau of Standards.. | 58, 281 | Buffalo Harbor, light station reconstructed.. | 565 |
| Barrel, standard, for dry commodities..... | 55, 284 | Building materials, tests..... | 57, 65, 67, 291, 292 |
| Bass, propagation..... | 441, 444, 445 | <i>See also</i> Cement; Concrete. | |
| <i>See also</i> Fisheries Bureau. | | | |

| | Page. | | Page. |
|---|----------------------------|--|---------------------|
| Buildings, Coast and Geodetic Survey..... | 10, | Chamberlain, Eugene Tyler, annual report..... | 721-750 |
| | 11, 133, 671 | Champlain Lake, fish culture..... | 92, 453 |
| Department..... | 9, 20 | Char force, consolidation..... | 30 |
| Standards Bureau..... | 10, 11, 66, 67, 307, 367 | Charger, grounding of steamer..... | 160 |
| tows in public..... | 113, 43 | Charleston, S. C., establishment of lighthouse | |
| Bulletin, Lighthouse Service..... | 110, 48 | depot..... | 528 |
| Standards Bureau, sales..... | 37, 903 | Charts, receipts from sales..... | 578 |
| Buoys. <i>See</i> Aids to navigation. | | Cheltenham, Md., magnetic observatory..... | 15, 171, 583 |
| Bureaus constituting Department..... | 6 | Chemical apparatus, tests by Bureau of | |
| <i>See also</i> names of bureaus. | | Standards..... | 280 |
| Butter, standard color specifications..... | 311, 321 | Chemical tests, by Bureau of Standards..... | 64, 323 |
| Butterfish, quantity and value..... | 403 | standard analyzed samples of materials..... | 315 |
| Buttons. <i>See</i> Pearl-button industry; Mussel | | Chemistry, research work of Bureau of Stand- | |
| culture. | | ards..... | 315-324 |
| Caddo Lake, mussel fishery..... | 414 | Chesapeake Bay, fisheries investigations..... | 91, 451 |
| California, field operations, Coast and Geo- | | inspection of oyster fleet..... | 190, 733 |
| detic Survey..... | 612, 621, 624 | new entrance buoy..... | 528 |
| salmon propagation..... | 434, 435 | Chicago, branch commercial office..... | 16, 44, 48 |
| sinking of steamer State of..... | 143, 150, 156 | Chicago Drainage Canal, study of water pollu- | |
| tuna fishery..... | 423-425 | tion..... | 105, 454 |
| Calorimetry, tests by Bureau of Standards..... | 284-294 | Children, statistics of occupations..... | 75, 378 |
| Canada, international boundary surveys..... | 168, | Chinese and Japanese, census report..... | 75, 378 |
| | 574, 666 | Chromium, melting point..... | 326 |
| regulations governing border fisheries..... | 103, 468 | Circulars and notices, number and cost of | |
| Cane sugar, standard heating value..... | 287 | printing..... | 779 |
| Canned goods, report on foreign markets..... | 207 | Cities, statistics issued..... | 69, 72, 74, 76, 360 |
| Cape Fear River, additional aids to naviga- | | Citizenship, officers of merchant marine..... | 185, |
| tion..... | 528 | | 186, 188, 750 |
| Cape Kumukahi, Hawaii, estimate for light | | City of Seattle, wrecking of steamer..... | 148, 150 |
| station..... | 560 | Civil-service employees, census inquiry..... | 382, 384 |
| Cape St. Elias, light and fog-signal station... | 119, | Civilian inspectors, Lighthouse Service..... | 108, 499 |
| | 477, 530 | Clackamas, Oreg., fish-cultural work..... | 428 |
| Cape Spencer, Alaska, estimate for light | | Clay products, investigation needed..... | 67, 360 |
| station..... | 559 | testing work done..... | 343 |
| Cape Vincent, N. Y., fish-cultural work..... | 428, 439 | <i>See also</i> Pottery industry. | |
| Carpenter shops, consolidation..... | 20 | Clays, melting points..... | 285 |
| Catfish, quantity and value..... | 403 | technical investigations..... | 341-344 |
| Causes of death, publication of index of | | Clayton Act. <i>See</i> Antitrust legislation. | |
| joint..... | 76, 373 | Clerks. <i>See</i> Personnel. | |
| <i>See also</i> Vital statistics. | | Cleveland, improvement of aids to naviga- | |
| Cement, granular analysis..... | 338 | tion..... | 529 |
| high-pressure steam tests..... | 336 | Clinch River, mussel fishery..... | 414 |
| hydration, study..... | 335 | Close season in seal islands..... | 99, 101, 102 |
| silica, comparative value..... | 339 | Clothing industry, costs of production... .. | 46, 48, 217 |
| standard specifications..... | 58, 337 | Coast and Geodetic Survey, appropriations | |
| time of setting, testing methods..... | 336 | and disbursements..... | 21-27, 589 |
| use in Lighthouse Service..... | 121 | cost of printing and binding..... | 778 |
| <i>See also</i> Concrete; Building materials. | | dangers to navigation discovered..... | 577 |
| Census Bureau, appropriations and expendi- | | estimate for new vessels..... | 18, 19 |
| tures..... | 21-27, 81, 384, 389 | field operations in detail..... | 591-682 |
| cost of printing and binding..... | 775 | geodetic, magnetic, and tidal work, sum- | |
| library, telegraph office, etc., abolished.... | 19-20 | mary..... | 573 |
| mechanical laboratory..... | 383 | geodetic work in detail..... | 581 |
| office hours of employees..... | 21 | handicap of deferred appropriations..... | 196 |
| personnel..... | 27, 30, 382, 388, 756, 757 | housing conditions..... | 10, 133, 571 |
| publication work..... | 381, 386, 785, 799 | hydrographic work, summary..... | 572, 578 |
| recommendations..... | 384 | international boundary surveys..... | 574, 666 |
| removal to Commerce Building..... | 9, 17, 81, 133 | leave regulations, changes..... | 764 |
| Secretary's review of activities..... | 60-84 | magnetic work..... | 584 |
| status of work..... | 367 | miscellaneous receipts..... | 26, 578 |
| summary of activities..... | 17, 60-84, 365 | office work..... | 682 |
| <i>See also</i> Personnel; Printing and binding. | | organization (chart)..... | 166 |
| Ceramics. <i>See</i> Clay; Porcelain; Pottery. | | personnel..... | 756, 757 |
| Certificates of inspection issued to vessels.... | 174, | publications issued..... | 589, 787, 799 |
| | 184, 606, 607 | Secretary's review of activities..... | 132-173 |

| | Page. | | Page. |
|---|----------------------|---|----------------------|
| Coast and Geodetic Survey, special duty.. | 500, 657 | Consular reports, special, published..... | 213, 218 |
| special surveys..... | 576 | in manuscript..... | 214 |
| summary of activities..... | 14, 15, 132, 173 | Cooper Lake, fish culture..... | 92, 452 |
| <i>See also</i> Personnel. | | Copper, electrotyping baths, study..... | 319-320 |
| Coast line, Alaska, United States, and United Kingdom..... | 118 | pyrometer tests..... | 286 |
| Cobalt, melting point..... | 325 | specific heat..... | 286 |
| Cod fisheries, quantity and value of product..... | 89, 395, 398, 404 | Coquille River, Oreg., estimate for improving aids to navigation..... | 551 |
| Code-signal letters assigned to light vessels..... | 118, 476 | Corporations, inquiry into State taxation systems..... | 50, 51, 52, 233, 235 |
| Codfish, propagation..... | 442, 443 | Corporations Bureau, appropriations and expenditures..... | 21-27, 235, 265 |
| <i>See also</i> Fisheries Bureau. | | cooperation with Department of Justice.... | 227 |
| Cold Springs, Ga., fish-cultural work..... | 428 | cost of printing and binding..... | 778 |
| Collectors of customs, assistance in enforcing navigation laws..... | 16, 189, 194, 739 | functions defined..... | 226-227 |
| College professors, research work at fisheries laboratories..... | 198 | merger in Federal Trade Commission.. | 17, 49, 223 |
| Collisions of vessels..... | 174 | personnel..... | 756, 757 |
| Lighthouse Service..... | 537 | publications issued..... | 783, 799 |
| Color blindness, examination of officers of vessels..... | 174, 312, 700 | Secretary's review of activities..... | 49-52 |
| inquiry as to testing methods..... | 312 | summary of year's work..... | 232-234 |
| Color photometry, investigations..... | 299 | text of organic law..... | 337, 338 |
| Color standards, specifications for..... | 63, 311 | <i>See also</i> Antitrust legislation. | |
| Colorado, field operations, Coast and Geodetic Survey..... | 612, 613, 618 | Cost keeping, Bureau of Lighthouses..... | 110, 480 |
| Columbia, stranding of steamship..... | 149 | Cost of production, collection of statistics..... | 46, 48, 217 |
| Columbia River, salmon fishery..... | 92, 97, 434 | Cotton, artificial regulation of prices, report published..... | 268 |
| <i>See also</i> Oregon; Washington. | | census reports on production, distribution, and consumption..... | 69, 74, 77, 370, 374 |
| Combustibles, transportation in vessels..... | 181, 184, 714 | classification and grading, report published..... | 268 |
| Commerce, defective statistical records..... | 46, 211 | Cotton exchanges, report published..... | 258 |
| <i>See also</i> Foreign and Domestic Commerce Bureau. | | Cotton goods, studies of foreign markets..... | 207, 217-218 |
| Commerce Building, addition..... | 9 | Cotton tare, report published..... | 263 |
| Commercial agents, activities..... | 18, 42, 44, 207 | Cottonseed oil, standard color specifications.. | 311 |
| reports published..... | 213, 217, 218 | use in tuna-canning industry..... | 424 |
| Commercial attachés..... | 18, 41, 44, 47 | Cottonseed products, census statistics..... | 207, 218 |
| appropriation for..... | 208 | report on European market..... | 374 |
| Commissioners, activities of shipping..... | 188, 739 | Counties, statistics of indebtedness..... | 72, 372 |
| Comptroller of the Treasury, decisions affecting personnel..... | 767 | Couplings, hose, standardization needed..... | 351 |
| Concrete, columns, tests for strength..... | 333 | Craig Brook, Me., fish-cultural work..... | 429 |
| compression tests..... | 339 | Cream, tests of density..... | 58, 280 |
| durability in alkali waters..... | 335 | Crews of vessels, nationality..... | 740 |
| effect of moisture and temperature changes..... | 338, 339 | <i>See also</i> Seamen. | |
| <i>See also</i> Cement. | | Crucibles, materials for..... | 327 |
| Condemned property, Lighthouse Service.. | 109, 479 | Crystals, optical study..... | 310 |
| receipts from sales..... | 26 | Cumberland River, mussel fishery..... | 414 |
| Conferences, analysis of nonferrous metals.... | 317 | Curacao, grounding of steamer..... | 148, 154 |
| lighthouse inspectors..... | 108, 478 | Current observations..... | 173, 574 |
| lubricating-oil consumers..... | 319 | Cusk fisheries, quantity and value of product..... | 89, 395, 398, 404 |
| Maine lobster..... | 105, 465, 466 | Customs officers. <i>See</i> Collectors of customs. | |
| paper manufacturers..... | 348 | Daily Consular and Trade Reports, sale.... | 38, 803 |
| safety of life at sea..... | 90, 717, 744 | Dangerous articles, transportation on vessels..... | 181, 184, 714 |
| Conference, weights and measures..... | 54, 61, 283 | Daniels, Secretary Josephus, letter in re hydrographic work in Pacific possessions..... | 157 |
| <i>See also</i> International conferences. | | Davies, Joseph E., annual report..... | 223-236 |
| Conflict of State laws relating to corporations..... | 50, 52, 233 | Day marks. <i>See</i> Aids to navigation. | |
| Conneaut, Ohio, estimate for light station.... | 550 | Deaf, census..... | 69, 74, 377 |
| Connecticut, field operations, Coast and Geodetic Survey..... | 591, 596, 597 | Death, publication of index of joint causes.. | 76, 373 |
| Construction materials, tests..... | 57, 65, 67, 291, 292 | Deaths, census statistics..... | 368 |
| <i>See also</i> Building materials. | | <i>See also</i> Vital statistics. | |
| Construction work, Lighthouse Service..... | 484 | Debt, decennial inquiry..... | 60, 72, 371, 372 |
| Consular officers, trade-promotion work.. | 18, 42, 44 | Decimeter for radiotelegraphy..... | 297 |

| | Page. | | Page. |
|--|-----------------|--|------------------------|
| Delaware, field operations, Coast and Geodetic Survey..... | 506, 601 | Endeavor, Coast and Geodetic Survey steamer, unseaworthiness..... | 134 |
| Delaware River, estimate for improving aids to navigation..... | 552 | Engineer force, consolidation..... | 30 |
| pollution by oil refineries and tank steamers..... | 105, 454 | Engineering research and testing by Bureau of Standards..... | 350-352 |
| Delay in appropriations, effect..... | 197-199 | Engineers of vessels licensed..... | 699 |
| Delhi, stranding of steamer..... | 150 | Engines, gasoline, comparative tests..... | 351 |
| Delinquent classes, census inquiry... 69, 74, 370, 376 | | Envelopes, number and cost of printing..... | 779 |
| Density, determinations for liquids..... | 280 | Equipment transferred to Department of Labor..... | 13 |
| Dental supplies, report on South American market..... | 207 | Erwin, Tenn., fish-cultural work..... | 429 |
| Dependent classes, census inquiry... 69, 74, 370, 376 | | Estimates for 1916..... | 17 |
| summary of State laws, publication..... | 377 | <i>See also</i> Appropriations and expenditures | |
| Depots, Lighthouse Service..... | 489-491, 502 | European war, effect on merchant marine... 185 | |
| Desertion of seamen..... | 740 | Excursion steamers, fireproofing..... 176, 184, 705 | |
| Detroit, branch commercial office..... | 16 | overloading..... 180, 184, 713, 742 | |
| estimate for lighthouse depot..... | 553 | Executive orders affecting personnel..... | 768 |
| Detroit River, construction of additional aids to navigation..... | 529 | in re nationality of officers of registered vessels..... | 186 |
| estimate for new aids to navigation..... | 549 | Expansion of materials, investigations. 280, 281, 310 | |
| Diamond-back terrapin culture..... | 94, 465 | Expenditures, test for economical..... 196-199 | |
| Dielectrics, study by Bureau of Standards... 298 | | <i>See also</i> Appropriations and expenditures. | |
| Disbursements. <i>See</i> Appropriations and expenditures. | | Explosives, transportation on vessels..... 174, 181, 184, 714 | |
| Disbursing Office. <i>See</i> Appropriations and expenditures. | | Exporters, list for distribution of trade information..... | 206 |
| Discovery, wrecking of steamer..... | 148 | Exposition, participation in Panama-Pacific International..... 13, 110 | |
| District of Columbia, surveys by Coast and Geodetic Survey..... | 500, 501, 661 | Extravagance, governmental..... | 19, 196-199 |
| Districts, division of steamboat-inspection... 182, 184, 716 | | Fairport, Iowa, biological studies 86, 93, 95, 457 | |
| inspections of lighthouse..... | 108, 478 | effect of delayed appropriation..... | 198 |
| Divisions of Department..... | 9, 14 | Fairport, Ohio, estimate for aids to navigation..... | 554 |
| Divorce, census..... | 74, 371 | Farallon, stranding of steamer..... | 149 |
| Dogfish, experiments for utilization 11, 106, 426 | | Farm-implement industry, investigation.... 50, 52, 233, 235 | |
| Domestic commerce, defective record..... | 46, 211 | report on International Harvester Co..... | 263 |
| Drugs and medicines, report on South American market..... | 207 | Farmers, census report on ages and stability..... | 75, 368 |
| Duck River, mussel fishery..... | 414 | Farms, fish culture..... 85, 106, 447 | |
| Duluth, Minn., fish-cultural work..... | 429 | statistics of occupancy..... | 75, 368 |
| Duplicating work..... | 781 | Federal Trade Commission, compulsory powers..... | 231 |
| consolidation in Division of Publications.. 782 | | functions defined..... | 227-232 |
| Earthenware industry. <i>See</i> Pottery industry. | | jurisdiction..... | 228 |
| Earthquakes, seismographic records... 574, 585, 586 | | legislative history..... | 223-226 |
| Economy, examples of doubtful..... 19, 196-199 | | merger of Bureau of Corporations..... | 9, 17, 49, 50, 52, 223 |
| Edenton, N. C., fish-cultural work..... | 412, 429 | quasi-judicial functions..... | 229 |
| Edith, grounding of steamship..... | 149 | relations to legislative, judicial, and executive departments..... | 231 |
| Editorial work, Division of Publications..... | 780 | text of organic act..... | 238-245 |
| Foreign and Domestic Commerce Bureau... 213 | | <i>See also</i> Antitrust legislation, Corporations Bureau. | |
| Edis Hook lighthouse reservation, lease... 114, 495 | | Feeble-minded in institutions, census report.. 69, 74, 370, 377 | |
| Efficiency, effect of delayed, incomplete, or insufficient appropriations..... | 196-199 | Fees, navigation..... | 26, 187, 189-194, 741 |
| records of employees..... | 29, 758, 760 | Fern, lighthouse tender, contract awarded.. 123, 491, 524 | |
| trust organization, inquiry..... | 51, 233 | Fertilizer industry, investigation..... | 50, 233 |
| Electrical industries, quinquennial census.. 69, 73, 372, 373 | | product of menhaden fisheries..... | 87, 410 |
| Electric light and power, standard specifications..... | 56, 60, 62, 305 | Financial statistics of cities..... | 69, 72, 74, 76, 369 |
| Electrical testing by Bureau of Standards... 299-300 | | Financial statements. <i>See</i> Appropriations and expenditures. | |
| Electricity, standard determinations..... | 296-307 | Fines, navigation..... | 26, 187, 189-194, 741 |
| Electrolysis mitigation..... | 56, 303-305 | | |
| Electrotyping, study of electrolytic baths.. 319-320 | | | |
| Ella, beaching of steamer..... | 145 | | |
| Elyria, Ohio, electrolysis survey..... | 304 | | |
| Employees. <i>See</i> Official Register; Personnel | | | |

| | Page. | | Page. |
|--|-------------------------|--|-----------------------|
| Fire, Coast and Geodetic Survey exposed.. | 134, 571 | Foreign vessels admitted to American registry..... | 135, 136, 138, 744 |
| risk in Department buildings..... | 10, 11, 17 | navigation fees and fines..... | 137, 741 |
| risks on vessels..... | 176, 181, 184, 706 | <i>See also</i> Vessels. | |
| Fire-alarm systems, census inquiry..... | 73, 573 | Forest products, census statistics..... | 69, 70, 370 |
| Fireproofing experiments..... | 57, 292 | Forrester Island, biological survey..... | 463 |
| river steamers..... | 176, 184, 706 | Fort McHenry Channel, Md., additional aids to navigation..... | 526 |
| Fish culture. <i>See</i> Fisheries Bureau | | Fort McHenry Military Reservation, use granted to Baltimore..... | 114, 495 |
| Fish eggs, distribution by species..... | 426 | Foundering of vessels..... | 174 |
| distribution through State fish commissions..... | 430-432 | <i>See also</i> Wrecks. | |
| Fish Hawk, steamer, biological investigations..... | 91, 104, 451 | Fox industry of Alaska, leasing of islands.... | 461 |
| Fish ponds, stocking of private..... | 85, 106, 447, 448 | regulations promulgated..... | 460, 461 |
| Fish pounds, lighting..... | 113, 493 | sale of skins..... | 26, 100, 461 |
| Fisheries Bureau, appropriations and expenditures..... | 21-27, 467, 468 | <i>See also</i> Alaska; Fisheries Bureau. | |
| branch office for Pacific coast..... | 464 | France, commercial attaché..... | 41, 43 |
| cooperation with States..... | 430-432 | cost of geodetic work..... | 160 |
| cost of printing and binding..... | 778 | praise of American geodetic work..... | 179 |
| Fur-Seal Service..... | 97, 458-460 | status of coast and geodetic work.... | 122, 161-163 |
| handicap of existing methods of appropriation..... | 197, 198 | Fraudulent advertising..... | 66 |
| hatcheries operated..... | 14, 427-430 | Fruit, approval of standard barrel..... | 55, 284 |
| housing conditions..... | 10, 460 | Funsten Bros. & Co., sealskins sold..... | 96 |
| personnel..... | 756, 757 | Fur-bearing animals. <i>See</i> Alaska. | |
| propagation and distribution of fishes. 85, 426-449 | | Furniture transferred to Department of Labor..... | 13 |
| publications issued..... | 466, 167, 788, 799 | | |
| Secretary's review of activities..... | 85-107 | Gaithersburg, Md., photographic zenith tube installed..... | 169 |
| <i>See also</i> Personnel. | | Galveston Harbor, construction of light station..... | 526 |
| Fishes. <i>See</i> Fisheries Bureau. | | Gas buoys. <i>See</i> Aids to navigation. | |
| Flame standards, studies by Bureau of Standards..... | 299 | Gas, calorimetric tests..... | 59, 286-287 |
| Flatfish, propagation work..... | 442, 444 | illuminating, candlepower measurement... 299 | |
| Florida, field operations, Coast and Geodetic Survey..... | 609, 610, 611 | heating value inquiry..... | 299 |
| fisheries laboratory..... | 94, 464 | measurement..... | 59, 303 |
| survey of oyster beds..... | 468 | standards of quality..... | 59, 302-303 |
| Florida Reefs, estimate for additional aids to navigation..... | 550 | testing methods..... | 303 |
| reporting of wrecks..... | 113 | tests for impurities..... | 320, 321 |
| Flounder fisheries, quantity and value of product..... | 403 | Gas meters, tests by Bureau of Standards.... | 279 |
| Fog signals, kind and number..... | 507 | Gedney, unseaworthiness of Survey steamer. 134, | |
| miscellaneous changes..... | 517, 518 | 135, 138-142 | |
| <i>See also</i> Aids to navigation. | | Geodetic work of Coast and Geodetic Survey..... | 158-165, 170, 581-584 |
| Foreign and Domestic Commerce Bureau, appropriations and expenditures..... | 21-27 | Georgia, field operations, Coast and Geodetic Survey..... | 611 |
| branch offices..... | 43, 207 | stranding of steamer..... | 149 |
| change in administrative officers..... | 43 | Germany, cost of geodetic work..... | 160 |
| commercial agents..... | 42, 207 | praise of American geodetic work..... | 159 |
| commercial attachés..... | 41, 208 | status of geodetic work..... | 132, 161-163 |
| Consular Reports Division..... | 213-215 | <i>See also</i> Berlin. | |
| cost of printing and binding..... | 778 | Glazes for ceramic ware..... | 340, 342 |
| cost of production, collection of statistics.. 46, 217 | | Glenesslin, wrecking of vessel..... | 148 |
| exporters' index..... | 206 | Gloucester, Mass., fish-cultural operations.... | 429, |
| Foreign Tariffs Division..... | 215 | 442, 443 | |
| personnel..... | 756, 757 | quantity and value of fishery products. 83, 395-406 | |
| publications issued..... | 213, 217, 218, 790, 799 | vessel fisheries..... | 83, 394 |
| Secretary's review of activities..... | 41-48 | Goat Island, Cal., estimate for improving lighthouse depot..... | 558 |
| Statistics Division..... | 208-213 | Goose Island Flats, N. J., estimate for light station..... | 556 |
| <i>See also</i> Personnel. | | Government-owned building for Department..... | 11 |
| Foreign markets. <i>See</i> Foreign and Domestic Commerce Bureau. | | Grampus, steamer, fish-egg collections..... | 443 |
| Foreign tariffs, publication..... | 216 | oceanographic investigations..... | 89, 90, 449, 450 |
| Foreign trade opportunities, publication.... | 215 | Grand Banks, iceberg phenomena..... | 90 |

| | Page. | | Page. |
|--|----------------------------|---|---------------------|
| Great Britain. <i>See</i> United Kingdom. | | Hunts Point, N. Y., construction of light and log-signal station..... | 527 |
| Great Lakes, fish propagation..... | 435 | Huron, Ohio, estimate for aids to navigation..... | 553 |
| loss of vessels by storm..... | 117, 476 | Hutchinson, Lincoln, commercial attaché at Rio de Janeiro..... | 41 |
| storm damage to aids to navigation..... | 476 | Hydrographic work, physical examination of Potomac River..... | 663 |
| vessel construction..... | 725, 726 | statement of progress..... | 572, 578 |
| vessels and tonnage..... | 723, 724 | Hydrometers, tests by Bureau of Standards.. | 280 |
| Green Lake, Me., fish-cultural work..... | 429 | Ice, latent heat determination..... | 286 |
| Green River, mussel fishery..... | 414 | Icebergs, Atlantic steamship lanes..... | 90, 450 |
| Ground for Bureau of Standards..... | 67, 359 | detection by temperature changes, inves- tigation..... | 288 |
| Guam, aids to navigation..... | 477 | Idaho, field operations, Coast and Geodetic Survey..... | 613 |
| Quantanamo, aids to navigation..... | 477, 549 | Illinois, pearl-button industry..... | 419 |
| Gulf Stream, biological and physical condi- tions..... | 59, 168, 657 | Illinois natural history survey, study of water pollution..... | 105, 454 |
| Hack-saw blades, study of relative efficiency. | 349 | Illuminants, aids to navigation..... | 506, 508-512 |
| Haddock, propagation..... | 442, 443 | Illuminating gas. <i>See</i> Gas. | |
| Haddock fisheries, quantity and value of product..... | 89, 395, 398, 404 | Illustrations, aids to navigation and annual appropriations, Lighthouse Service, 1901-1916..... | 115 |
| Hake fisheries, quantity and value of prod- uct..... | 89, 398, 400, 404 | coast line of United States, Alaska, and United Kingdom..... | 132 |
| Hale, Albert, commercial attaché at Buenos Aires..... | 41 | geodetic work in various countries..... | 160-163 |
| Halibut fisheries, quantity and value of product..... | 89, 91, 396, 400, 404, 451 | operation of wire drag..... | 143 |
| Harrington, A. I., commercial attaché at Lima..... | 41 | organization of Coast and Geodetic Survey. | 166 |
| Harris, Wm. J., annual report..... | 363-389 | wrecks in Alaskan waters (steamers Thomas L. Ward, City of Seattle, Charger, Olympia, Glenesslin, Curacao, and Mariechen)..... | 150 |
| Havens, V. L., commercial attaché at San- tiago..... | 41 | Immoral conditions on seal islands..... | 100, 106 |
| Hawaii, aids to navigation, construction of light station on Kilauea Point..... | 530 | Implement industry, investigation of farm.. | 50, 52, 233, 235 |
| improvement of light station at Kau- hola..... | 558, 567 | Indebtedness, publication of statistics of na- tional and State..... | 72-78, 372 |
| proposed lighthouse on Cape Kumukahi. | 560 | Index and guide cards, number and cost..... | 779 |
| field operations, Coast and Geodetic Sur- vey..... | 14, 132, 151, 172, 652-657 | Index of joint causes of death, publication.. | 76, 373 |
| lighthouse depot, estimate for..... | 554 | India, cost of triangulations..... | 180 |
| magnetic observatory..... | 585 | praise of American geodetic work..... | 159 |
| Heaton oil field, investigation..... | 51, 52, 233, 235 | status of geodetic work..... | 161-163 |
| Heat measurements by Bureau of Stand- ards..... | 58, 62, 63, 284-294 | Indian River, Fla., estimate for improving aids to navigation..... | 557 |
| Henderson Point, Me., estimate for light station..... | 560 | Indiana, mussel culture and pearl-button in- dustry..... | 95, 419 |
| Henry Island, Wash., estimate for light sta- tion..... | 551 | Indians, census report..... | 75, 377, 378 |
| Heroic acts by Lighthouse Service em- ployees..... | 123, 532 | Inflammable and explosive articles on freight vessels..... | 714 |
| Herring fisheries, quantity and value of product..... | 89, 397, 403, 404 | Injuries to Federal employees, compensation | 762, 763 |
| Hilo, Hawaii, estimate for aids to naviga- tion..... | 559 | Ink, printing, analysis..... | 65, 319 |
| Holston River, mussel fishery..... | 414 | Insane in institutions, census report. | 69, 74, 370, 377 |
| Homer, Minn., fish-cultural work..... | 429 | Inspectors, Lighthouse Service, conferences. | 108, 478 |
| Honolulu, additional aids to navigation, esti- mate for..... | 551 | periods of service..... | 499 |
| magnetic observatory..... | 15, 171, 585 | salaries..... | 495 |
| shipping commissioner for..... | 188 | Institutions, census of inmates..... | 69, 74, 370, 377 |
| Horses dispensed with by Department..... | 12, 20 | Insulation, electric, tests..... | 298 |
| Hose couplings, standardization needed..... | 351 | Internal commerce, defective record..... | 46, 211 |
| Hours of employees, rearrangement..... | 21 | International boundaries, surveys..... | 574, 666 |
| Housing conditions, Coast and Geodetic Sur- vey..... | 10, 11, 571 | International Conferences, Load Line..... | 195 |
| Fisheries Bureau..... | 469 | Maritime..... | 90, 744 |
| Hudson River, discovery of hidden rock..... | 158 | Safety of Life at Sea..... | 189, 194, 717, 744 |
| estimate for improving aids to navigation.. | 550 | Unification of Maritime Law..... | 195 |
| Hulls of vessels, inspections..... | 174, 175, 184, 704 | International Geodetic Association, member- ship of United States..... | 168, 169 |
| | | new epoch in geodesy credited to United States..... | 159 |

| | Page. | | Page. |
|--|------------------|---|--------------------------|
| International Harvester Co., report of investigation..... | 263 | Leaves of absence, average for Department... regulations..... | 765 764 |
| International Radiotelegraphic Convention, enforcement..... | 188, 189, 735 | Letterheads, number and cost of printing.... | 779 |
| Iowa, field operations, Coast and Geodetic Survey..... | 613 | Leveling, precise..... | 582 |
| mussel culture and pearl-button industry.. | 92, 96, 419 | <i>See also</i> Coast and Geodetic Survey | |
| grounding of motor vessel..... | 149 | Libraries, consolidation of Department..... | 19 |
| Ireland. <i>See</i> United Kingdom. | | Lighthouse Service..... | 109, 479 |
| Iron, determination of melting point..... | 59, 325 | Licenses, masters and mates of vessels. 174, 180, 699 | |
| international cooperation on methods of analysis..... | 317 | officers of motor boats..... | 697 |
| preparation of electrolytic..... | 316 | pilots on vessels..... | 699 |
| technical study of properties..... | 324, 327 | radio operators and apparatus..... | 188, 737 |
| Isostasy. <i>See</i> Coast and Geodetic Survey. | | Life and property saved, Lighthouse Service 123, 533 | |
| Italy, status of geodetic work..... | 161-163 | Life hazard in electrical practice..... | 305-306 |
| Japan, agent to study seal life..... | 100, 460 | Life preservers, inspections..... | 175, 699, 706 |
| status of geodetic work..... | 161-163 | Life-saving appliances O. H. Tittmann appointed on board..... | 590 |
| Japanese and Chinese, census report..... | 75, 378 | Lifeboats, inspections..... | 706 |
| Joe Flogger Shoal, Del., light and fog-signal station..... | 527 | Light tests of transparent materials..... | 312 |
| Jones, E. Lester, special study of conditions in Alaska..... | 106 | standard wave lengths, determined..... | 63, 307 |
| Juvenile delinquents, census..... | 69, 74, 370, 377 | Light lists, change in size..... | 110, 730 |
| Kansas pearl-button industry..... | 419 | selling proposed..... | 37, 88, 803 |
| Kaolin. <i>See</i> Clay; Pottery; Porcelain. | | Light vessels, Bush Bluff, Norfolk Harbor.. | 564 |
| Katmai Volcano, effects of eruption..... | 101, 433 | construction work..... | 524 |
| Kauhola Point Light Station, improvements | 558, 567 | descriptive list..... | 520 |
| Kayak, wrecking of steamer..... | 150 | estimates for new vessels..... | 556, 557 |
| Kennebec River, estimate for light station... | 559 | launching of No. 96 and No. 98..... | 524 |
| Kentucky, fish hatchery..... | 86 | loss of No. 82 on Lake Erie..... | 476 |
| effect of delayed appropriation..... | 197 | repairs..... | 492 |
| pearl-button industry..... | 419 | <i>See also</i> Vessels. | |
| Keweenaw Waterway, Mich., estimate for light station..... | 556 | Lighthouse Service, appropriations and expenditures..... | 21-27, 114, 487-489, 540 |
| Key West, Fla., marine biological laboratory. | 94, 464 | civil-service regulations..... | 770 |
| Kilanua Point, Hawaii, construction of light station..... | 530 | compensation to employees for injuries.... | 763 |
| Labor Department, articles transferred..... | 13 | construction work..... | 494 |
| data regarding subcontractors furnished... | 113 | completed..... | 525, 526, 562 |
| printing fund transferred..... | 34, 777 | cooperation with other Government services..... | 112, 493 |
| Labor force, consolidation..... | 30 | depots..... | 489-491, 502 |
| Laboratories, operations at fisheries..... | 88 | engineering and construction..... | 120, 494 |
| stimulus to research..... | 93, 196, 455-458 | estimates for 1916..... | 489, 542 |
| Lake Champlain, fish culture..... | 92, 452 | expenditures from all funds..... | 540 |
| Lake Cooper, fish culture..... | 92, 452 | handicap of delayed appropriations..... | 198 |
| Lake Erie, improvement of aids to navigation | 529 | improvement of apparatus and equipment | 121, 485-487 |
| sinking of light vessel..... | 117, 476 | inspectors, conferences..... | 108, 478 |
| Lake of the Woods, topographic survey..... | 575 | service..... | 499 |
| Lake Pepin, fish culture..... | 92, 452 | jurisdiction..... | 499 |
| Lakes, fisheries, surveys, and investigations | 91, 452 | legislation recommended..... | 494 |
| Land for Bureau of Standards..... | 67, 359 | light vessels, in commission..... | 123, 520, 521 |
| Launches. <i>See</i> Vessels. | | repairs..... | 492 |
| Laurel, launching of lighthouse tender. 123, 491, 524 | | under construction..... | 524 |
| Laws, conflict of State corporation..... | 50, 52, 233 | limits of districts..... | 500 |
| dependent classes, publication of summary | 74, 377 | maintenance costs..... | 482-484 |
| enforcement of navigation.... 16, 189-194, 729-732 | | miscellaneous receipts..... | 26, 540 |
| Leadley, Geo. W., annual report..... | 753-774 | recent legislation..... | 114, 494 |
| Leadville, Colo. fish-cultural work..... | 429 | report of investigation..... | 502, 503 |
| Leases, Commerce Building..... | 9 | salary increases recommended..... | 495, 496 |
| Edis Hook Lighthouse Reservation..... | 114, 495 | saving of life and property..... | 123, 532 |
| effect of delayed appropriations..... | 198 | special works under construction..... | 526-530 |
| fox islands of Alaska..... | 101 | tenders, descriptive list..... | 522 |
| | | under construction..... | 524 |
| | | unexpended balances..... | 531 |
| | | Lighthouse tenders, construction..... | 524 |
| | | damage by collision..... | 537 |
| | | descriptive list..... | 522 |
| | | estimate for general service tender..... | 543 |
| | | Fern, contract awarded..... | 123, 491, 524 |

| | Page. |
|---|-------|
| Lighthouse tenders, Laurel, launching. 123, 491, 524 | |
| Woodbine, construction completed..... 524, 564 | |
| <i>See also</i> Lighthouses Bureau; Aids to navigation. | |
| Lighthouses Bureau, appropriations and expenditures..... 21-27, 114 | |
| administrative methods and economies..... 108, | |
| 473, 478-480 | |
| cost-keeping system..... 480 | |
| cost of printing and binding..... 778 | |
| handicap of delayed appropriations..... 198 | |
| personnel..... 473, 756, 757 | |
| publications issued..... 539, 792, 799 | |
| Secretary's review of activities..... 108-131 | |
| <i>See also</i> Lighthouse Service; Aids to navigation. | |
| Lighting, tests of methods and appliances.... 306 | |
| Lights. <i>See</i> Aids to navigation. | |
| Lima, commercial attaché..... 41 | |
| Lima, scientific inquiries into properties.. 344, 345 | |
| Lincoln Rock, Alaska, rebuilding of light station..... 530 | |
| Linseed oil, determination of iodine number.. 318 | |
| Lives lost from marine accidents..... 174, 701 | |
| <i>See also</i> Wrecks. | |
| Lives saved by Lighthouse Service..... 123, 532 | |
| Load Line Conference, International..... 195 | |
| Lobsters, conference on fishery..... 105, 465, 466 | |
| cultural experiments on Pacific coast..... 86, 446 | |
| culture and distribution..... 441, 443 | |
| London, commercial attaché..... 41, 42 | |
| International Load Line Conference..... 195 | |
| International Maritime Congress..... 90, 744 | |
| International Radiotelegraphic Convention, enforcement..... 188, 189, 735 | |
| market for seals..... 96 | |
| <i>See also</i> United Kingdom. | |
| Lorain, Ohio, improvement of aids to navigation..... 529 | |
| Los Angeles, Cal., board of local steamboat inspectors established..... 183, 184, 716 | |
| Louisiana, field operations, Coast and Geodetic Survey..... 610, 612 | |
| Louisville, Ky., improvement of fish hatchery..... 86, 464 | |
| effect of delayed appropriation..... 197 | |
| fish-cultural work..... 429 | |
| Ludington, Mich., estimate for aids to navigation..... 555 | |
| Lumber industry, investigation.. 50, 51, 52, 233, 234 | |
| report published..... 262, 263 | |
| Lunches in Commerce Building..... 21 | |
| McAdoo, Secretary W. G., letter in re sinking of revenue cutter Tahoma..... 146 | |
| McArthur, Survey steamer, unseaworthiness..... 134-142 | |
| Mackerel fisheries, quantity and value of product..... 89, 397, 402, 404 | |
| <i>See also</i> Fisheries Bureau. | |
| Magnetic observations, Coast and Geodetic Survey..... 15, 171, 573, 584, 587 | |
| Magnetism, study by Bureau of Standards.. 298 | |
| Mail service established..... 20 | |
| Mailing lists, revision..... 801 | |
| Maine, estimate for light at St. Croix River entrance..... 552 | |

| | Page. |
|---|-------|
| Maine field operations, Coast and Geodetic Survey..... 591, 593, 594 | |
| international boundary survey..... 575, 666 | |
| lobster conference..... 105, 465, 466 | |
| Manistique, Mich., construction of light station..... 529 | |
| Manitowoc, Wis., estimate for improving light station..... 555 | |
| Manual of Instructions, Lighthouse Service. 109, 479 | |
| Mammoth Spring, Ark., fish-cultural work.. 429 | |
| Manchester, Iowa, fish-cultural work..... 429 | |
| Manganese, melting point..... 325 | |
| Manifests of cargoes, suggested modification of laws..... 211 | |
| Manufactures, census..... 17, 60, 70, 74, 79, 379, 380 | |
| Marlechen, grounding of steamer..... 150 | |
| Marine borers, depredations..... 94 | |
| Marine fishes, propagation..... 441-444 | |
| Marine-Inspection Service, name proposed for Steamboat-Inspection Service..... 184, 718 | |
| Mariposa, accident to steamship..... 149 | |
| Maritime Congress, International..... 90, 744 | |
| Maritime Law, International Conference for Unification..... 195 | |
| Markets. <i>See</i> Foreign and Domestic Commerce Bureau. | |
| Marriage and divorce, census..... 74, 371 | |
| Maryland, field operations, Coast and Geodetic Survey..... 601, 602, 663 | |
| pearl-button industry..... 419 | |
| Maryland Shell Fish Commission, assistance rendered..... 590 | |
| Massachusetts, field operations, Coast and Geodetic Survey..... 591, 594, 595, 596 | |
| pearl-button industry..... 421 | |
| Masters and mates of vessels licensed.. 174, 180, 669 | |
| Measurement standards, defined..... 271 | |
| Measures of capacity, tests by Bureau of Standards..... 278 | |
| Medical expenses, Lighthouse Service..... 109, 479 | |
| Medicines, report on South American market 207 | |
| Melting points, determined for specified elements..... 285, 325 | |
| refractory oxides..... 285 | |
| Menhaden industry, factories and equipment 408 | |
| investment statistics..... 406, 409 | |
| operating expenses..... 409 | |
| persons engaged and wages..... 406, 409 | |
| processes of manufacture..... 408 | |
| production statistics..... 407, 410 | |
| quantity and value of fish..... 87, 406, 410 | |
| vessels and equipment..... 406, 407, 409 | |
| Merchant marine, foreign-built vessels admitted to registry..... 185, 186, 188, 744 | |
| licensing of officers..... 711 | |
| number and tonnage..... 185, 723 | |
| Messenger service established..... 20 | |
| Metallurgy, investigations by Bureau of Standards..... 58, 59, 324-332 | |
| Metals, melting points of refractory..... 285 | |
| Meters, gas, accuracy requirements..... 302 | |
| water-current, calibration..... 350 | |
| Miah Maull Shoal, N. J., construction of light and fog-signal station..... 527 | |
| Michigan, additional aids to navigation..... 529 | |
| field operations, Coast and Geodetic Survey..... 617 | |
| pearl-button industry..... 419 | |

| | Page. | | Page. |
|--|---------------------|--|------------------------------|
| Michigan Island, Wis., estimate for light station..... | 558 | Navigation Bureau, personnel..... | 755, 757 |
| Migratory birds, protection..... | 113, 493 | publications issued..... | 793, 799 |
| Migratory fishes, national control..... | 103, 468 | Radio Service..... | 188, 735-739 |
| Milk and cream, determination of density.... | 58, 280 | Secretary's review of activities..... | 185-195 |
| Milwaukee, estimates for lighthouse construction..... | 555, 558 | shipping commissioners..... | 188, 739 |
| Mines and quarries, statistics issued..... | 69, | <i>See also</i> Personnel; Vessels. | |
| | 70, 74, 367, 368 | Navigation laws, enforcement..... | 16, 189, 729 |
| Minnesota, field operations, Coast and Geodetic Survey..... | 616, 617 | international conferences..... | 90, 195, 744 |
| mussel culture and pearl-button industry.. | 95, 419 | recent enactments..... | 185, 186, 188, 744 |
| Miscellaneous receipts turned into Treasury.. | 26 | violations..... | 191, 730-732 |
| Mississippi, field operations, Coast and Geodetic Survey..... | 610, 611, 612, 613 | Navy, Secretary of, letter in re hydrographic work in Pacific possessions..... | 157 |
| Mississippi River, estimate for improving aids to navigation..... | 550 | Navy Department, radiograms transmitted for Lighthouse Service..... | 113, 493 |
| Mississippi River Commission, assistance rendered..... | 590, 605 | Navy yards, bases for lighthouse vessels.... | 113, 493 |
| Missouri, field operations, Coast and Geodetic Survey..... | 617 | Nebraska, field operations, Coast and Geodetic Survey..... | 613 |
| pearl-button industry..... | 421 | Negroes in United States, census report..... | 75, 379 |
| Mobile, shipping commissioner for..... | 188 | Neosho, Mo., fish-cultural work..... | 429 |
| Montana, field operations, Coast and Geodetic Survey..... | 612, 615, 618 | Neosho River, mussel fishery..... | 415 |
| Mortality statistics, publication..... | 78, 373 | New England, fishery resources..... | 404 |
| <i>See also</i> Vital statistics. | | international-boundary survey..... | 575 |
| Mortar, strength measurements..... | 344 | statistics of vessel fisheries..... | 394-406 |
| <i>See also</i> Lime; Cement. | | New Hampshire, field operations, Coast and Geodetic Survey..... | 594, 596 |
| Motor boats, Coast and Geodetic Survey exhibit at New York..... | 660 | New Jersey, field operations, Coast and Geodetic Survey..... | 597, 599, 601 |
| inspections..... | 174, 696, 697, 707 | pearl-button industry..... | 421 |
| officers licensed..... | 697 | New Mexico, field operations, Coast and Geodetic Survey..... | 612, 618 |
| overcrowding..... | 713 | New Orleans, branch commercial office.... | 16, 44, 48 |
| regulation needed..... | 178, 181, 708 | estimate for improving aids to navigation.. | 550 |
| regulation recommended..... | 184, 734 | New York, branch commercial office..... | 16, 44, 48 |
| Motor cars. <i>See</i> Automobiles | | Evening Post, quoted..... | 157 |
| Mount St. Elias, survey..... | 680 | field operations, Coast and Geodetic Survey..... | 596, 597, 598 |
| Moving pictures for exposition use..... | 14 | pearl-button industry..... | 421 |
| Muskingum River, mussel fishery..... | 415, 421 | New Zealand, geodetic work modeled after American..... | 159 |
| Mussel fishery, equipment, quantity and value..... | 414, 415, 417 | Nickel, melting point..... | 325 |
| persons engaged..... | 414, 415, 417 | Nickel oxide, temperature measurements.. | 285, 325 |
| products quantity and value..... | 415, 416, 418 | Nine Mile Point, Mich., estimate for light station..... | 560 |
| <i>See also</i> Pearl-button industry; Sea mussels. | | Nonferrous metals, experimental investigation of properties..... | 328, 329, 333 |
| Mussels, cultural experiments.... | 88, 92-95, 106, 453 | Norfolk Harbor, Va., additional aids to navigation..... | 528, 564 |
| Naphthalene, standard heating value..... | 62, 287 | North Carolina, condition of fisheries..... | 411-413 |
| Nashua, N. H., fish-culture work..... | 429 | field operations, Coast and Geodetic Survey..... | 601, 604, 605, 607, 608, 664 |
| National Association of Refrigeration Engineers, cooperation with..... | 59, 289 | lighthouse property damaged by storm.. | 118, 476 |
| National parks and reservations, fish planting..... | 104, 448 | North Dakota, field operations, Coast and Geodetic Survey..... | 616, 618 |
| Nationality of seamen..... | 185, 186, 188, 740 | North Head Light Station, effect of delayed appropriation..... | 198 |
| Navigation, dangers surveyed and reported.. | 577 | Northville, Mich., fish-cultural work..... | 429 |
| <i>See also</i> Aids to navigation. | | Northwestern, grounding of steamship..... | 148 |
| Navigation Bureau, analysis of year's vessel construction..... | 725-726 | Occupations, census statistics issued.. | 69, 75, 367, 378 |
| appropriations and expenditures..... | 21-27, 739 | Oceanographic work, Coast and Geodetic Survey..... | 167, 590 |
| cost of printing and binding..... | 778 | studies by Bureau of Fisheries..... | 89, 449-451 |
| enforcement of navigation laws..... | 16, | surveys in Atlantic Ocean..... | 657 |
| | 159-194, 729-732 | Oconto, Wis., establishment of pierhead light | 530 |
| fines collected..... | 741 | Office hours of employees, rearrangement.... | 21 |
| handicap of delayed appropriations..... | 199 | Officers of merchant marine, licenses.... | 174, 180, 669 |
| merchant marine, number and tonnage.... | 723 | nationality..... | 185, 186, 188, 740 |
| miscellaneous receipts..... | 26, 185, 741 | | |

| | Page. |
|---|-------------------------|
| Official Register, compilation of collateral statistics..... | 80, 380 |
| proposed new form..... | 71, 384, 385 |
| publication..... | 69, 369 |
| Ohio, damage to steamship..... | 149 |
| pearl-button industry..... | 415, 421 |
| Ohio River, mussel fishery..... | 88, 92, 415 |
| Oil, cottonseed, standard color specifications..... | 311 |
| production of menhaden fisheries..... | 87, 410 |
| Oil field, investigation of Oklahoma..... | 51, 52, 233, 235 |
| Oil refineries, pollution of Delaware River..... | 106, 454 |
| Oils, conference of lubricating-oil consumers..... | 319 |
| determination of thermal expansion..... | 58, 280 |
| iodine numbers of linseed and petroleum..... | 318 |
| viscosity determinations..... | 291 |
| Oklahoma, oil field investigation..... | 51, 52, 233, 235 |
| pearl-button industry..... | 419 |
| Olympia, stranding of steamship..... | 149, 150 |
| Oleomargarine, color tests..... | 311 |
| Optical instruments, study of various types..... | 313 |
| Optics, investigations by Bureau of Standards..... | 307-315 |
| Orangeburg, S. C., fish-cultural work..... | 430 |
| improvement of fish hatchery..... | 464 |
| effect of delayed appropriation..... | 197 |
| Oregon, estimate for improving aids to navigation in Coquille River..... | 561 |
| field operations, Coast and Geodetic Survey..... | 612, 621, 623, 624 |
| improvement of Warrior Rock Light Station..... | 530 |
| salmon propagation..... | 92, 97, 434 |
| shad culture..... | 446 |
| stranding of steamship..... | 148 |
| Organization, Coast and Geodetic Survey (chart)..... | 166 |
| Department..... | 9, 14 |
| Lighthouse Service..... | 108, 499 |
| Osgood, Wilfred H., appointed to study seal life..... | 100, 460 |
| Osprey, operations of steamer..... | 96, 462 |
| Otter-trawl fishery, investigation of operations..... | 89, 406 |
| statistics of catch..... | 406 |
| Overloading of passenger vessels..... | 179, 180, 184, 713, 742 |
| Oysters, study of diseases and enemies..... | 93, 455 |
| survey of Florida beds..... | 468 |
| Oxides, melting points of refractory..... | 285 |
| Pacific coast, additional supervising inspection district..... | 183, 184, 716 |
| branch of Bureau of Fisheries..... | 104, 464 |
| salmon culture..... | 92, 432 |
| wire-drag work..... | 143-148, 571 |
| Paint, tests of materials..... | 323-324 |
| Panama Canal, effect of opening..... | 188 |
| Panama Canal act, foreign vessels admitted to American registry..... | 185, 186, 188, 747 |
| Panama-Pacific International Exposition, participation of Department..... | 13, 110, 479 |
| Paper investigations..... | 64, 348-349 |
| causes of deterioration..... | 348 |
| chemical researches..... | 319 |
| conference of manufacturers..... | 348 |
| effects of atmospheric moisture..... | 348 |
| slaking and coating materials..... | 348 |

| | Page. |
|--|-------------------------|
| Paper investigations, standardization proposed..... | 340 |
| testing work done..... | 348 |
| Parcel-post matter, increased limits of weight..... | 110 |
| Paris, commercial attaché..... | 41, 42 |
| Parker, George H., appointed to study seal life..... | 100, 460 |
| Parks, fish planting in national..... | 104, 448 |
| Passengers, counting on steamers..... | 742 |
| number carried on vessels..... | 174, 702 |
| overcrowding on vessels..... | 179, 180, 184, 713, 742 |
| Pathologist for study of fish diseases..... | 107, 469 |
| Paupers in almshouses, census report..... | 60, 74, 370, 377 |
| Paving blocks, durability tests..... | 340 |
| production from slag..... | 342 |
| Pearl-mussel culture..... | 88, 92-96, 106, 453 |
| <i>See also</i> Mussel fishery; Pearl-button industry. | |
| Pearl River, mussel fishery..... | 415 |
| Pearl-button industry, freight costs..... | 420, 422 |
| persons engaged and wages..... | 419, 421 |
| plants and property..... | 419, 421 |
| production, quantity and value..... | 420, 422 |
| raw materials, quantity and value..... | 419, 421 |
| <i>See also</i> Mussel fishery. | |
| Pearl Harbor, Hawaii, estimate for aids to navigation..... | 551 |
| Peking, commercial attaché..... | 41, 42 |
| Pelagic sealing..... | 98, 99, 459 |
| Pennsylvania, field operations, Coast and Geodetic Survey..... | 601 |
| pearl-button industry..... | 419 |
| Pension Bureau employees, transfers..... | 30, 759 |
| Pensions for superannuated employees..... | 31, 762 |
| Pepin Lake, fish culture..... | 92, 452 |
| Perch, propagation work..... | 440 |
| <i>See also</i> Fisheries Bureau. | |
| Perrier, Commandant, praise of American geodetic work..... | 159 |
| Personnel, appointments and separations..... | 757 |
| bonds of officers..... | 774 |
| Census Bureau..... | 81, 382, 388, 756, 757 |
| Coast and Geodetic Survey..... | 756, 757 |
| compensation to employees for injuries..... | 762, 763 |
| Corporations Bureau..... | 756, 757 |
| decisions of Comptroller of Treasury..... | 767 |
| detail of employees..... | 758 |
| district system of certification..... | 772 |
| Division of Publications..... | 811 |
| efficiency records..... | 29, 758, 760 |
| Executive orders affecting..... | 768 |
| Fisheries Bureau..... | 756, 757 |
| Foreign and Domestic Commerce Bureau..... | 756, 757 |
| law of apportionment..... | 766 |
| leaves of absence..... | 764 |
| Lighthouse Service..... | 473, 499, 770 |
| Lighthouses Bureau..... | 473, 499, 756, 757 |
| Navigation Bureau..... | 756, 757 |
| presidential appointments..... | 29, 42, 758 |
| rearrangement of office hours..... | 21 |
| retirement of superannuated employees..... | 762 |
| Secretary's Office..... | 756, 757 |
| Standards Bureau..... | 364, 369, 756, 757 |
| Steamboat-Inspection Service..... | 756, 757 |
| superannuated employees..... | 21, 496, 762 |

| | Page. | | Page. |
|---|-------------------|--|-------------------------|
| Petermann's Geographic Magazine, praise of American geodetic work..... | 150 | Precise leveling..... | 523 |
| Petrograd, commercial attaché..... | 41, 42 | See also Geodetic work. | |
| Petroleum, determination of iodine number..... | 318 | President, appointments in Department. 29, 43, 758 | |
| Petroleum industry, investigation..... | 50, | Executive order in re nationality of officers of registered vessels..... | 186 |
| 51, 52, 223, 225 | | Friblof Islands, census of seal herd..... | 450 |
| report published..... | 257 | pelagic sealing..... | 98, 99, 450 |
| Phalarope, steamer, fish-egg collections..... | 444 | radiotelegraphic station..... | 97, 458 |
| Philippine Islands, field operations, Coast and Geodetic Survey..... | 639-651 | social conditions..... | 100, 106 |
| hydrographic surveys. 14, 132, 140, 151, 170, 573, 581 | | Price maintenance, investigation..... | 50, 223 |
| Phosphate rock, analysis determinations..... | 318 | Princeton, wrecking of gunboat..... | 157 |
| Physical constants, defined..... | 272 | Printing and binding, allotment and expenditures..... | 34, 777 |
| Pike perch, propagation on Great Lakes..... | 438 | Census Bureau..... | 351, 778 |
| Piling, protection from borers..... | 94 | cost by bureaus..... | 778 |
| Pilots licensed..... | 609 | estimates for 1916..... | 815 |
| Pineapple-canning industry, report..... | 207 | quantity and cost, by classes..... | 34-36, 779 |
| See also Canned goods. | | revision of laws..... | 810 |
| Pittsburgh, branch commercial office..... | 16 | Printing ink, analyses..... | 64, 319 |
| Standards Bureau laboratory building needed..... | 15, 64, 357 | Prisoners, census..... | 60, 74, 370, 377 |
| Plantations in the South, census report..... | 379 | Production costs, collection of statistics.. 46, 48, 217 | |
| Plates, inspection of marine boiler..... | 175, 699 | Promotions, utilization of efficiency records. 29, 758 | |
| Platinum, study of properties..... | 321 | Professors, college, research work at fisheries laboratories..... | 198 |
| thermoelectric method of determining impure..... | 329 | Propagation of food fishes..... | 85, 426 |
| Plasters, durability tests..... | 338 | See also Fisheries Bureau. | |
| See also Cement; Concrete; Mortar. | | Property, receipts from sales of condemned.. 26 | |
| Point Arena Lighthouse, completion..... | 530 | saved by Lighthouse Service..... | 123, 532 |
| Point Pinos, Cal., estimate for improving light station..... | 557 | transfers to Department of Labor..... | 13 |
| Point Vicente, Cal., estimate for light station..... | 548 | Public-utility investigations by Bureau of Standards..... | 55, 302-306 |
| Polarimetry, general conference suggested... 308 | | Public-Health Service, condemnation of Coast and Geodetic Survey Building..... | 134 |
| tests..... | 308-310 | Inspections for Lighthouse Service..... | 113, 493 |
| Police-patrol signaling systems, census statistics..... | 73, 373 | Inspections for Bureau of Fisheries..... | 409 |
| Political activity of employees, prohibited forms..... | 32, 773 | Publications, Census Bureau..... | 396, 785, 799 |
| Pollock, product of fisheries..... | 89, 396, 400, 404 | Coast and Geodetic Survey..... | 589, 787, 799 |
| propagation..... | 442, 443 | condensation of statistical..... | 208, 209, 780 |
| Pollution of waters, investigations..... | 93, 105, 454 | Corporations Bureau..... | 256-264, 783, 799 |
| Population, estimates for intercensal years.. 371 | | distribution..... | 37, 353, 800 |
| graphical presentation in statistical atlas... 371 | | Fisheries Bureau..... | 466, 467, 785, 799 |
| stability of agricultural..... | 75, 368 | Foreign and Domestic Commerce Bureau.. 208, | |
| Porcelain, causes of viscosity in kiln..... | 241 | 213, 216, 217, 790, 799 | |
| See also Pottery; Clays. | | foreign tariff..... | 216, 218 |
| Port Angeles, Cal., lease of Ediz Hook Lighthouse reservation..... | 114, 495 | issued by Department..... | 37, |
| Port Clinton, Ohio, fish-cultural work..... | 438, 439 | 45, 60, 65, 83, 87, 92, 167, 783-799 | |
| Port Real, P. R., estimate for light station.. 560 | | Lighthouse Service..... | 539, 792, 799 |
| Portage Lake, Mich., estimate for light station..... | 559 | monthly list issued..... | 804 |
| Portland, wrecking of steamship..... | 149 | Navigation Bureau..... | 793, 799 |
| Porto Rico, estimates for new light stations. 554, 560 | | Secretary's Office..... | 783, 799 |
| field operations, Coast and Geodetic Survey..... | 14, 132, 638 | sales..... | 38, 45, 214, 219, 802 |
| organization of department of weights and measures..... | 61, 282-283 | Standards Bureau..... | 284, 331, 352, 793, 799 |
| Vieques magnetic observatory..... | 586 | Steamboat-Inspection Service..... | 798, 799 |
| Pottery, study of glazes..... | 340, 342 | Publications, Division of, duplicating work.. 781 | |
| Pottery industry, costs of production..... | 46, 48, 217 | editorial work..... | 780 |
| Pratt, Edward Ewing, appointed Chief, Foreign and Domestic Commerce Bureau.. 43 | | personnel..... | 811 |
| Preble, Edward A., appointed to study seal life..... | 100, 460 | printing and binding expenditures.... 34, 777-779 | |
| | | report of Chief..... | 775-817 |
| | | revision of mailing lists..... | 801 |
| | | Secretary's review of activities..... | 33-40 |
| | | Puget Sound, additional aids to navigation .. 530 | |
| | | Put-in Bay, Ohio, fish-cultural work..... | 430 |
| | | Putnam, G. R., annual report..... | 473-496 |
| | | Pyrometry, tests by Bureau of Standards.... 59, | |
| | | 284, 285, 290 | |

| | Page. | | Page. |
|---|-----------------------|--|-----------------------|
| Quarries, statistics issued | 69, 70, 74, 367 | Rondout Creek, N. Y., construction of light and fog-signal station | 527 |
| Quarters. <i>See</i> Buildings. | | Rosin, standard color specifications | 311 |
| Quartz, absorption constants | 315 | Rubber, methods of analyzing | 318 |
| optical study | 310 | tests of physical properties | 349 |
| Quincy Ill. fish-cultural work | 430 | Rutter, Frank R. appointed Assistant Chief Bureau of Foreign and Domestic Commerce | 43 |
| Radiation, measurement o. transmitted energy | 314 | Sabine Pass, Tex., appropriation for light station | 528 |
| standards established | 62, 314 | Saccharimeter, calibration and standardization | 309 |
| tests and experiments | 315 | Sacramento River, salmon propagation | 92, 434 |
| Radio communication. <i>See</i> Radio Service; Radiotelegraphy. | | Safety of Life at Sea, International Conference | 189, 194, 744 |
| Radio Service, expenditures | 739 | Safety rules for electric plants | 56, 306 |
| inspections | 735 | Saidle, wrecking of steamer | 148 |
| operators licensed | 188, 737 | Sail vessels, inspections | 174, 696, 697 |
| personnel | 735 | officers licensed | 697, 699 |
| Radiotelegraphy, decrement of waves, measurement | 297 | <i>See also</i> Vessels. | |
| enforcement of laws | 188, 735 | St. Croix River Me., estimate for entrance light | 552 |
| installation on Pribilof Islands | 97, 453 | St. Francis River, mussel fishery | 417 |
| laboratory needed | 358 | St. George Island. <i>See</i> Alaska; Pribilof Islands. | |
| research work by Bureau of Standards | 307 | St. Johns River, Fla., estimate for new aids to navigation | 549 |
| <i>See also</i> Radio Service. | | St. Johnsbury, Vt. fish-cultural work | 430 |
| Radium, studies by Bureau of Standards | 62, 298 | St. Louis, branch commercial office | 16, 44, 48 |
| Rails, finishing temperatures | 325 | electrolysis survey | 304 |
| Railway material, inquiry into causes of defective | 328, 333 | sales of fur skins | 98, 100, 453 |
| Railway track scales, tests | 281-282 | St. Marys River, Mich., aids to navigation | 566 |
| Railways, statistics of electric | 73, 372 | St. Paul Island. <i>See</i> Alaska; Pribilof Islands. | |
| Rainy Lake, topographic survey | 575 | St. Petersburg. <i>See</i> Petrograd. | |
| Ram Island, Me., estimate for light station | 559 | Salaries. <i>See</i> Appropriations and expenditures. | |
| Receipts, miscellaneous, of Department | 26 | Sales, condemned property | 26, 109, 479, 524 |
| navigation fees and fines | 187, 189, 741 | seal and fur skins | 98, 100, 453 |
| Redfield, William C., annual report | 7-199 | publications | 33, 45, 802 |
| Redfish, quantity and value of catch | 403 | Saline River mussel fishery | 415 |
| Redondo, damage to steamer | 150 | Salmon. Alaska fisheries | 96, 198, 463 |
| Refractive indexes, alcohols | 320 | cultural experiments on Atlantic coast | 86, 447 |
| determination of standard | 313 | propagation work on Pacific coast | 86, 92, 432-435 |
| Refrigerating plant, installation | 12 | Samoa, aids to navigation | 477 |
| Refrigeration Engineers cooperation with National Association | 59, 289 | San Francisco, branch commercial office | 16, 44, 48 |
| Refrigeration studies and experiments | 57, 59, 286, 289, 320 | division of steamboat-inspection district | 183, 716 |
| Registered merchant marine | 185, 723 | purchases for seal islands | 97, 453 |
| Registry of foreign-built vessels | 185, 186, 188, 744 | San Marcos, Tex., fish-cultural work | 430 |
| Regulations, Aleutian Islands Reservation | 464 | Sand Hills, Mich., estimate for light station | 555 |
| new edition of Lighthouse Service | 110, 480 | Sand Island Light Station, Ala., estimate for improvement | 557 |
| Religious bodies, census | 74, 371 | Sandy Hook, discovery of scallop bed | 90, 450 |
| Rent, Department quarters | 9 | estimate for aids to navigation | 552 |
| stable | 20 | Santa Barbara, Cal., estimate for light station | 559 |
| <i>See also</i> Leases | | Santiago, Chile, commercial attaché | 41 |
| Reports and pamphlets, number and cost of printing | 779 | Saratoga, grounding of steamer | 149 |
| Resale price maintenance, investigation | 50, 233 | Saving of life and property, Lighthouse Service | 123, 532 |
| Reservations, fish-planting, in Government | 104, 448 | Scales, railway track, tests by Bureau of Standards | 281-282 |
| Retirement of supernannuated employees | 31, 762 | tests by Bureau of Standards | 279 |
| Revenue-Cutter Service, acknowledgment of aid | 16, 459 | Scallops, discovery of bed in Atlantic Ocean | 90, 450 |
| enforcement of navigation laws | 189-194, 730 | Sea, International Conference on Safety of Life | 189, 194, 744 |
| Revenue systems, census inquiry | 60, 72, 372 | oceanographic cruises | 80, 163, 449-451, 500 |
| Rhode Island, field operations, Coast and Geodetic Survey | 594, 596, 597 | | |
| new fish-cultural station | 86, 463 | | |
| Rio de Janeiro, commercial attaché | 41 | | |
| Rita Newman, wrecking of gasoline boat | 148 | | |
| Rocks, pinnacle. <i>See</i> Wire-drag work. | | | |

| | Page. | | Page. |
|--|---------------|---|--------------------|
| Sea mussels, utilization as food..... | 106, 475 | Standards Bureau, additional ground needed..... | 67, 359 |
| Seal Islands, social conditions..... | 100, 106 | appropriations and expenditures..... | 21-27, 354-356 |
| Sealskins, receipts from sales..... | 26, 98, 459 | chemistry, research work..... | 315-324 |
| Seamen, allotment notes issued..... | 741 | cost of printing and binding..... | 778 |
| desertions from American vessels..... | 740 | electrical investigations..... | 296-307 |
| nationality..... | 740 | engineering research and testing..... | 350-352 |
| lighthouse vessels, increased pay recom- mended..... | 496 | functions..... | 53, 271-276 |
| shipped and discharged..... | 740 | handicap of delayed appropriations..... | 199 |
| <i>See also</i> Crews of vessels. | | housing conditions..... | 10, 66, 367 |
| Seattle, branch commercial office..... | 16, 44, 48 | library..... | 353 |
| branch office of Bureau of Fisheries..... | 104, 464 | low-temperature laboratory..... | 291 |
| headquarters for proposed supervising in- spection district..... | 183, 184, 716 | metallurgical investigations..... | 324-332 |
| purchases for seal Islands..... | 97, 458 | miscellaneous receipts..... | 26, 356 |
| wrecking of steamer City of..... | 148, 150 | organization..... | 276-277 |
| Secretary's Office, cost of printing and bind- ing..... | 778 | personnel..... | 354, 359, 756, 757 |
| personnel..... | 756, 757 | publications issued..... | 284, 793, 799 |
| publications issued..... | 783, 799 | relation to public..... | 54, 275-276 |
| Seismograph records, Coast and Geodetic Sur- vey..... | 574, 585, 586 | Secretary's review of activities..... | 53-68 |
| Sewage pollution, Chicago Drainage Canal..... | 105, 454 | structural material investigations..... | 332-350 |
| Delaware River..... | 105, 454 | tests, summary of work..... | 356 |
| Potomac River..... | 105, 454, 663 | transverse testing machine needed..... | 67, 358 |
| Shad, New England fisheries, quantity and value of product..... | 403 | Star of Russia, wrecking of ship..... | 148 |
| propagation work..... | 412, 439, 440 | State, Secretary of, letter in re International Conference on Safety of Life at Sea..... | 196 |
| Shelving, steel substituted for wood..... | 20 | State laws relating to corporations, conflict..... | 50, |
| Shingle industry, investigation..... | 51, 234 | | 52, 233 |
| report published..... | 263 | State of California, sinking of steamer..... | 143, |
| Ship-registry act of August 18, 1914..... | 185, 188, 744 | | 150, 156, 701 |
| vessels registered..... | 747 | Staten Island lighthouse depot, improve- ments..... | 527, 553, 563 |
| Shipbuilding, impetus to American..... | 186 | States, inadequate laws governing fisheries..... | 104, 466 |
| vessels under construction in American yards..... | 727 | Statistical Atlas, Census..... | 69, 74, 365, 371 |
| Shipping commissioners, summary of activi- ties..... | 188, 739 | Statistical publications, condensation..... | 206, 209, 780 |
| Ships. <i>See</i> Vessels. | | Steamboat-Inspection Service, administra- tion..... | 708, 716 |
| Sieves, cement testing..... | 279, 336 | annual meeting of supervising inspectors..... | 716 |
| Sitka, Alaska, magnetic observatory..... | 15, 171, 588 | appropriations and expenditures..... | 21-27, 694 |
| Smith, H. M., annual report..... | 393-469 | boiler inspection..... | 177, 706 |
| Smithsonian Institution, nomination of seal investigator..... | 100, 460 | certificates of inspection issued..... | 696, 697 |
| Social conditions on seal Islands..... | 100, 106 | cost of printing and binding..... | 778 |
| Solicitor, summary of work..... | 39 | division of supervising districts..... | 183, 716 |
| South Carolina, field operations, Coast and Geodetic Survey..... | 606, 608 | hull inspection..... | 175, 704 |
| new fish hatchery..... | 86, 464 | inspection methods..... | 703 |
| South Dakota, field operations, Coast and Geodetic Survey..... | 618 | investigation of disasters..... | 712 |
| Spearfish, S. Dak., fish-cultural work..... | 430 | motor-vessel inspection..... | 178, 707 |
| Special agents. <i>See</i> Commercial agents. | | officers licensed..... | 180, 697, 699 |
| Specifications, Government purchases..... | 64, 65, 274 | organization..... | 693 |
| hulls, filing recommended..... | 175, 704 | personnel..... | 756, 757 |
| lighthouse construction, standard..... | 121, 485 | publications issued..... | 798, 799 |
| Spectroscopy, studies by Bureau of Stand- ards..... | 63, 307-311 | recommendations..... | 184, 718 |
| Sponge fishery, act of Congress regulating..... | 468 | reinspections..... | 698, 711 |
| Springfield, Ohio, electrolysis survey..... | 304 | Secretary's review of activities..... | 174-186 |
| Springfield, Mass., electrolysis survey..... | 56, 304 | summary of office work..... | 693 |
| Springfield, Utah, establishment of fish-cul- tural station..... | 463 | Steamers. <i>See</i> Vessels. | |
| Stable requirements of Department..... | 12, 20 | Steel, determination of carbon..... | 316 |
| Standard Oil Co., position in petroleum in- dustry, report published..... | 257 | expansion coefficients..... | 325 |
| | | influence of gases, oxides, and slag on qual- ity..... | 317 |
| | | standard methods for analysis..... | 316, 330 |
| | | technical study of properties..... | 334 |
| | | structural, tests to determine formulas for strength..... | 332 |
| | | Steel industry, report published..... | 261-263 |
| | | Storm damage to aids to navigation..... | 117, 118, 476 |
| | | Stratton, S. W., annual report..... | 271-261 |
| | | Street railways, census inquiry..... | 73, 373 |

| | Page. | | Page. |
|---|---------------------------|--|-------------------------|
| Structural materials, technical studies by Bureau of Standards..... | 332-350 | Titanium, melting point..... | 326 |
| <i>See also</i> Building materials. | | Tittmann, O. H., annual report..... | 560-590 |
| Stuccos, durability tests..... | 338 | appointed on board on life-saving appliances..... | 590 |
| Sturgeon fishery, Delaware River, statistics..... | 411 | Tobacco, census statistics of leaf..... | 60, 78, 370, 375, 376 |
| Submarine signals in commission..... | 518 | Tobacco industry, investigation..... | 50, 52, 233, 235 |
| <i>See also</i> Aids to navigation. | | report published..... | 259 |
| Sugar, standard testing..... | 63, 300, 310 | Toledo, estimate for improving aids to navigation..... | 551 |
| Superannuated employees..... | 31, 408, 762 | Tombigbee River, mussel fishery..... | 417 |
| Surgical expenses, Lighthouse Service..... | 100, 479 | Tompkinsville, general lighthouse depot, improvements..... | 527, 553, 563 |
| Surgical supplies, report on South American market..... | 207 | manufacture of apparatus for Lighthouse Service..... | 121, 485 |
| Surveyor General of India, praise of American geodetic work..... | 159 | Tonnage, duties collected..... | 26, 187, 748 |
| Surveyors General of New Zealand, praise of American geodetic work..... | 159 | measurement, American and British law compared..... | 743 |
| Swordfish, quantity and value..... | 80, 40', 404, 405 | modification of regulations..... | 743 |
| Tahoma, loss of revenue cutter..... | 18, 146, 150 | merchant marine..... | 185, 723 |
| Tampa Bay, estimate for aids to navigation..... | 555 | Trade Commission. <i>See</i> Federal Trade Commission. | |
| Tariffs, assistance of inquiries into costs of production..... | 46 | Trade opportunities, publication of foreign..... | 215 |
| effect on improved lighthouse apparatus..... | 121, 485 | Trade promotion. <i>See</i> Foreign and Domestic Commerce Bureau. | |
| publication of foreign..... | 45, 216 | Transportation by water, report published..... | 260-261 |
| Tarragon, motor boat, maintenance costs..... | 733 | Transportation of petroleum, report published..... | 257 |
| operations..... | 178, 180, 732-734 | Transportation on vessels, dangerous articles..... | 183, 184, 714 |
| Taxation, decennial inquiry..... | 60, 72, 371, 372 | passengers..... | 174, 179, 180, 184, 702 |
| Taxation of corporations, inquiry..... | 50, 51, 52, 233, 234, 235 | Transverse testing machine needed..... | 67, 358 |
| report published..... | 260 | Trawl fishery, investigation..... | 80, 405 |
| Telegraphs, consolidation of Department's offices..... | 20 | Treasury, Secretary of, letter regarding sinking of revenue cutter Tahoma..... | 146 |
| quinquennial census..... | 73, 372 | Triangulation, progress of work..... | 573, 581-584 |
| Telephones, consolidation of Department's exchanges..... | 20 | Trout propagation, Great Lakes..... | 435, 436 |
| quinquennial census..... | 73, 372 | inland streams..... | 444 |
| Tenders. <i>See</i> Lighthouse tenders. | | Trusts, economic efficiency, progress of investigation..... | 51, 233 |
| Tennessee, field operations, Coast and Geodetic Survey..... | 612, 613 | Tucson, Ariz., magnetic observatory..... | 15, 171, 585 |
| pearl-button industry..... | 421 | Tunny fishery of California, canning industry..... | 88, 423-425 |
| Tennessee River, mussel fishery..... | 417 | methods of fishing..... | 424 |
| Terra cotta. <i>See</i> Clay; Pottery. | | Tupelo, Miss., fish-cultural work..... | 436 |
| Terrapin, experiments in culture..... | 94, 455 | Turbines, steam, data on windage resistance..... | 350 |
| Texas, field operations, Coast and Geodetic Survey..... | 611, 612 | Turbidity, observations in Potomac River..... | 664 |
| Textile investigations..... | 346-348 | standards of measurement..... | 312 |
| cotton bagging and ties..... | 347 | Tyee Junior, damage to steamer..... | 146 |
| further inquiries needed..... | 346 | Typewriters, purchases..... | 30 |
| physical properties of cotton yarns..... | 247 | Uhler, Geo., annual report..... | 601-719 |
| shrinkage of wools..... | 346 | Unexpended balances of appropriations..... | 14, 26, 34 |
| specifications for Government purchases..... | 347 | special works in Lighthouse Service..... | 531 |
| Thermometers, tests..... | 58, 264 | Unification of Maritime Law, International Conference..... | 196 |
| Thermocouples, studies by Bureau of Standards..... | 287, 291 | United Kingdom, agent to study seal life..... | 100, 400 |
| Thimble Shoal, Va., construction of light station..... | 527 | coast line, comparison..... | 132 |
| Thirteenth Census. <i>See</i> Census Bureau. | | law for measurement of vessels..... | 743 |
| Thomas L. Wand, wreck of steamer..... | 150 | status of geodetic work..... | 161-163 |
| Thompson, Erwin W., commercial attaché at Berlin..... | 41 | Utah, field operations, Coast and Geodetic Survey..... | 613 |
| Tide tables, sales..... | 26, 38, 803 | new fish-cultural station..... | 86, 408 |
| Tides, observations by Coast and Geodetic Survey..... | 15, 173, 574, 600 | Uyak, wrecking of steamer..... | 149 |
| Tile. <i>See</i> Clay; Pottery. | | Vanadium, melting point..... | 326 |
| Timber, concentration of ownership, report published..... | 262 | Vann law, North Carolina, effects..... | 412, 413 |
| <i>See also</i> Lumber industry. | | Varnish, methods of analysis..... | 294 |

| | Page. | | Page. |
|--|------------------------------|--|--------------------------------------|
| Vaughan, Dan C., annual report..... | 775-817 | War, Secretary of, letters regarding coast survey of Philippine Islands..... | 155, 156 |
| Veditz, C. W. A., commercial attaché at Paris..... | 41 | Wardens in Alaska, failure of appropriations..... | 101 |
| Velocipede cars, use in field work..... | 170, 582 | Warrior Rock, Oreg., improvement of light station..... | 530 |
| Vermont, field operations, Coast and Geodetic Survey..... | 506 | Washington, estimate for light station on Henry Island..... | 551 |
| Vessels, accidents resulting in loss of life..... | 174, 476, 701 | field operations, Coast and Geodetic Survey..... | 612, 619, 621 |
| alien officers..... | 750 | halibut fishery..... | 91, 451 |
| boiler inspection..... | 174, 177, 181, 706 | lobster planting..... | 86, 146 |
| Coast and Geodetic Survey, estimates for new..... | 18, 19 | lumber and shingle industry..... | 61, 234, 263 |
| list of employed..... | 142 | salmon propagation..... | 92, 433, 434 |
| unseaworthy..... | 134 | <i>See also</i> Pacific coast; Seattle. | |
| construction in American yards..... | 724-729 | Watch force, consolidation..... | 30 |
| documented..... | 725 | Watches, tests by Bureau of Standards..... | 58, 279 |
| fireproofing excursion..... | 176, 184, 705 | Water-cooling plant installed..... | 12 |
| inspections..... | 174, 184, 696, 698 | Water-power development, report published..... | 263 |
| defects in laws..... | 175, 177, 184, 704, 706, 718 | Water terminals, report published..... | 200-261 |
| operating machinery..... | 698 | Water transportation, report published..... | 200-261 |
| steel plates, etc., for boilers..... | 174, 699 | Wave lengths of light, measured..... | 61, 307 |
| suspension of laws concerning..... | 186 | Wealth, decennial inquiry..... | 69, 72, 371, 372 |
| licenses to officers..... | 174, 180, 697, 699 | Weights and measures, conference of State representatives..... | 283 |
| lighthouse, Alaskan service..... | 17, | proposed Federal control..... | 281 |
| crews..... | 96, 119, 123, 477, 524 | <i>See also</i> Standards Bureau. | |
| damage by collision..... | 537 | West Indies, construction of light station on Navassa Island..... | 528 |
| operations of tenders..... | 491, 522 | West Virginia, pearl-button industry..... | 421 |
| repairs..... | 112, 492 | White River, mussel fishery..... | 417 |
| saving of life and property..... | 123, 532 | White Sulphur Springs, W. Va., fish culture..... | 430 |
| storm damage..... | 117, 118, 476 | Whitefish, propagation on Great Lakes..... | 436, 437 |
| tender Woodbine completed..... | 123, 564 | Window glass, composition studies..... | 343 |
| wreck of Armeria sold..... | 524 | Wire-drag work..... | 18, 117, 142, 143, 150-158, 171, 571 |
| lives lost..... | 174, 701 | operation of apparatus (illustration)..... | 143 |
| merchant marine, number and tonnage..... | 185, 723 | Wireless telegraphy. <i>See</i> Radiotelegraphy. | |
| recent legislation..... | 185, 183, 188, 744 | Wisconsin, additional aids to navigation..... | 529 |
| methods of inspecting..... | 703 | field operations, Coast and Geodetic Survey..... | 617 |
| navigation fees and fines..... | 187, 189, 741 | pearl-button industry..... | 96, 421 |
| officers licensed..... | 697, 699 | Woodbine, lighthouse tender, commissioned..... | 123, |
| operated by Department..... | 14 | 524, 564 | |
| overloading..... | 179, 180, 184, 713, 742 | Wooden shelving dispensed with..... | 20 |
| passengers carried..... | 174, 702 | Woods Hole, estimate for improving light-house depot..... | 549 |
| registry act of August 18, 1914..... | 744 | fish-cultural operations..... | 430, 443, 444 |
| vessels registered..... | 747 | fisheries laboratory..... | 93, 455 |
| transportation of dangerous articles..... | 181, 184, 714 | effect of delayed appropriation..... | 198 |
| under construction in American shipyards..... | 727 | Woodward, Dr., president Carnegie Institution, praise of American geodetic work..... | 160 |
| <i>See also</i> Aids to navigation; Light vessels; Lighthouse tenders. | | Wrecks, vessels in Alaska..... | 17, 119, 143-150, 154 |
| Vieques, P.R., magnetic observatory..... | 15, 171, 586 | sale of lighthouse tender Armeria..... | 524 |
| Violations of navigation laws..... | 730-732 | <i>See also</i> Vessels. | |
| fines collected..... | 26, 741 | Wyoming, field operations, Coast and Geodetic Survey..... | 612, 618 |
| penalties remitted..... | 731 | new fish hatchery..... | 86, 464 |
| Virginia, field operations, Coast and Geodetic Survey..... | 601, 602, 663 | Wytheville, Va., fish-cultural work..... | 430 |
| Viscosity of oils, determination..... | 291 | Yachts, Supreme Court decision respecting tax..... | 187, 741 |
| Visual defects, examinations..... | 174, 312, 700 | tax collected..... | 187, 741 |
| Vital statistics, census inquiries..... | 69, 74, 75, 368, 373 | <i>See also</i> Vessels. | |
| Volcano, eruption of Alaskan..... | 101, 433 | Yes Bay, Alaska, fish-cultural work..... | 430 |
| Voltmeter, standardization..... | 296 | improvement of fish hatchery..... | 433 |
| Volumetric tests by Bureau of Standards..... | 280 | Yukon, grounding of steamer..... | 149 |
| Wages of lighthouse seamen..... | 17, 111, 496 | Zapora, stranding of steamer..... | 149 |
| Wagons dispensed with..... | 12, 20 | | |
| Walrus, transfer of authority over, recommended..... | 132 | | |
| Wand, Thomas L., wreck of steamer..... | 150 | | |
| War, European, effect on merchant marine..... | 186 | | |

36



285



